DOCUMENT RESUME

ED 066 831 EA 004 575

AUTHOR	Razik, Taher A.
TITLE	Systems Approach to Teacher Training and Curriculum Development: The Case of Developing Countries.
INSTITUTION	United Nations Educational, Scientific, and Cultural Organization, Paris (France). International Inst. for Educational Planning.
REPORT NO	IIEP-71-D-1-A
PUB DATE	72
NOTE	151p.
AVAILABLE FROM	UNIPUB, Inc., P. O. Box 433, New York, N. Y. 10016 (Order No. B-2997, $4.50)
EDRS PRICE	MF-$0.65 HC Not Available from EDRS.
DESCRIPTORS	Administrative Problems; *Case Studies; Curriculum Design; *Curriculum Development; Decision Making; *Developing Nations; Educational Objectives; Educational Planning; Educational Quality; Models; *Systems Approach; *Teacher Education
IDENTIFIERS	Ceylon; Kuwait; Sudan

ABSTRACT

This publication describes a model for teacher training and curriculum development in developing nations that utilizes a systems approach. The model focuses on the development of a qualitative analysis concerned with the desired objectives of the educational activities. According to the author, the model (1) can be constantly adapted and corrected in the light of experience, (2) is designed to achieve a specified and measurable outcome, and (3) is designed to keep the end constantly in view. Although the model has been designed for developing countries in today's world, it has also been constructed with an eye to the future. With certain modifications, the model could be applied to any contemporary educational program. The three developing countries of Sudan, Kuwait, and Ceylon were selected for case studies and as examples of the model's contemporary application possibilities. A specific case study for Sudan is reproduced in the second part of the book. (Author/DN)

ED 066831

Systems approach to teacher training and curriculum development: *the case of developing countries*

Taher A. Razik

EA 004 525

Paris 1972
Unesco: International Institute for Educational Planning

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Published in 1972 by the United Nations
Educational, Scientific and Cultural Organization
Place de Fontenoy, 75 Paris-7e
Cover design by Hugh M. Neil
Printed by Maison d'édition, Marcinelle

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Printed in Belgium

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Preface

Among the various problems which all countries have to face in connexion with their educational systems, one of the most difficult and currently unresolved concerns curriculum design and the corresponding system of teacher training. Aware of the importance of this aspect of education planning, the IIEP invited Professor Taher A. Razik, of the State University of New York at Buffalo, to join the Institute as a consultant during his sabbatical year 1969/70, thus giving him the opportunity to construct a model based on the systems approach to curriculum design and teacher training, as well as to outline all the administrative problems which would arise in its implementation.

In spite of the fact that this model deals more specially with problems facing developing countries, it could easily be applied, with certain modifications, to any contemporary educational programme.

In order to test the applicability of his model, the author has endeavoured to partially implement it in three countries he visited—Ceylon, Kuwait and Sudan. The IIEP wishes to express its gratitude to the authorities in these three countries for their kind co-operation in the project. The case study of the Sudan prepared by Mr. Razik forms the second part of this publication.

Mr. Razik's study is a new contribution in a practically unexplored field. The IIEP, in publishing it, offers decision-makers in this field a tool for analysis which in spite of its shortcomings—inherent in the nature of the topic itself—may prove to be very helpful in the quest for improvement in the quality of teaching.

Raymond Poignant
Director, IIEP

Acknowledgement

The author wishes to express his deep appreciation to the many people who have co-operated in making this study possible.

Special thanks go to Raymond Poignant, Director of the International Institute for Educational Planning, Unesco, for allocating the financial support which was necessary to carry on this work. Also to Philip Coombs, the previous director of the IIEP, for his efforts in arranging the consultantship during my sabbatical leave from the State University of New York at Buffalo.

I would also like to express my thanks to the Ministers of education and the governments of Ceylon, Kuwait and Sudan for agreeing to participate in this study. The co-operation of the officials and agencies of the above countries made this study possible.

My colleagues in the IIEP and the State University of New York at Buffalo encouraged me and offered valuable suggestions for which I am grateful. I am indebted particularly to Dr. Allen Kuntz for his constructive criticism of the model, and for the encouragement which he offered. Finally the acknowledgement would not be complete without expressing my thanks to Patrick J. Nalbone and to Jeanne McKnight Nalbone for their many efforts and editorial assistance.

Paris
July 1970

Taher Razik

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Introduction

It is a recognized fact that all nations of the world are facing ever-increasing demands for free, universal education, especially on the elementary level. In the developed nations, the history of education reveals alternating periods of weakness and strength, depending on the changing needs of society, the economic situation and the quality of the educational systems themselves. Today the developed nations are encountering demands for social reform as the result of increased social consciousness. As yet, however, they have not been able to reach their goals or even to define them in concrete terms.

In the developing nations, the problems are even greater considering the immediacy of their needs. They cannot afford the luxury of (long periods of) time to accomplish what is necessary. Indeed, one should not forget the complexity of the problems of the developing countries; i.e., political, social and economic problems, which make the tasks of their governments and leaders extremely difficult. One of the main hopes for alleviating the burden of finding solutions to these problems seems to be in the development of effective educational systems. The validity of any educational system naturally is dependent upon the quality of the teaching and the availability of competent teachers. In order to meet these demands, each developing country needs to determine the appropriate means for training such qualified instructional personnel. This task is not simply one of finances or recruiting. It also involves the establishment of teacher-training systems which reflect the over-all expectations of the educational system and the country's various social institutions.

In the light of the above considerations, the International Institute for Educational Planning (IIEP) has attempted to find workable solutions which will be compatible with the process of development in the developing nations. With this in mind, the author went to the Institute as a resident consultant to design a model for teacher training and curriculum development in developing nations, utilizing a systems approach.

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In recent years the use of the systems approach in education has gradually become widespread. It is now apparent that highly creative and successful solutions to the planning problems of educational systems can be developed through such an approach. Because systems approach employs highly adaptive methodology it can be utilized to solve a wide variety of educational problems. It has been found to be particularly useful in dealing with the qualitative aspects of educational problems and planning. The following study was conducted for the purpose of providing developing countries with guidelines for curriculum development and for establishing teacher-training programmes. This study is an example of the application of a systems approach to these two problems.

It was realized that *any* planned educational system is better than none at all. It was also realized, however, that it is infinitely preferable to have an educational system which is effective in providing a 'quality education'. Prior to this study, educational planners of the IIEP emphasized the quantitative aspects of educational systems in attempting to achieve the goals of free and universal education held by most developing countries. These quantitative aspects include demographic studies, socio-economic conditions, cost analysis of the existing and projected educational system, etc. While this study utilizes all of the necessary quantitative data, the focus is to develop a qualitative analysis concerned with the desired objectives of the educational activities. It is hoped that this approach of qualitatively-oriented analysis will serve as a precedent for all educational planning.

What a quality education is varies from country to country and depends, naturally, on how each country defines its own educational needs. Moreover, even though these needs may be clear, there is rarely any means of evaluating whether a nation's educational system is achieving its objective of providing a 'quality education' for its people. Therefore, the proposed model is an attempt to introduce such a means; i.e., it is an open system. As an open system, it offers continuous evaluation functions which will allow for checking and revising both the objectives and the methods of achieving them.

Essentially, the model has three main characteristics. The first is that it can be constantly adapted and corrected in the light of experience. Second, it is designed to achieve a specified and measurable outcome. Third, it is designed so that it is always possible to see the end in view.

There are two main reasons for the adaptability of this model. The first is that the model has been developed using the techniques of systems. This method required the principal investigator to break down the elements of the problem in question into relevant components. These components, then, in the second level of analysis, were broken down into components themselves, and this process was continued until meaningful and workable units were

isolated. This is the technique that was utilized in developing the model and it is also the method recommended for use in performing the teaching act.

The second reason for the adaptability of the model is the philosophical approach toward the institution of education The central issue which explains this philosophy is the approach toward the problem of decision-making. It is recognized that the decision to implement a programme (such as the one suggested by the model) as well as the decisions concerning over-all goals lie in the hands of government. This is mainly because of economic feasibility and the need to have the co-operation of the authorities in power. Within the programme itself, the author also recognizes the need for an administrative or management group whose responsibility it is to see that the programme runs efficiently and meets its established goals. This area is treated in the model as a sub-system for management. The instructional sub-system of the model, however, is designed to provide the maximum diversification of decision-making responsibilities. Instructors, instructional supervisors, individual trainees, and groups of trainees (acting as equals) all participate in making decisions concerning every aspect of the programme, including curriculum, methods of instruction, individual progress, evaluation, necessity for remedial work, etc.

The model has been designed for use in today's world, but it was also constructed with an eye to the future so that it will remain valid for certain foreseeable situations in the coming decades.

For purposes of study, three developing countries were selected for case studies and as examples of the model's application today. While visiting these three countries, Sudan, Kuwait, and Ceylon, information was collected and analyzed to understand the countries' relative strengths and weaknesses in relation to their existing educational structures and their educational goals. The three countries are at different levels of economic development and have very different amounts of resources at their disposal. These three studies gave a clear idea of the extent to which it is possible to generalize and adapt the model to varying situations. They also demonstrated the possibility of using only selected parts of the model to help solve a given country's particular problems.

The following study, which evolved from a systems approach to analyzing teacher-training programme and curriculum development, is useful to ministries of education and to all people concerned with educational planning. And while this model was constructed for developing countries, it may be instrumental to educational planners in any teacher-training and curriculum-development institutes.

This book is divided into two parts. The first part describes the model and explains in detail both its construction and operation. It is hoped that this

part will be of use to any country wishing to apply the model to its own system of education. The second part of the book gives, as an example of the application of the model, one of the case studies mentioned above—that for Sudan.[1]

It is hoped that both sections will be of interest to all educational planners, but it is realized that for very sound reasons some may have greater interest in one part than in the other.

1. The studies on Ceylon and Kuwait are obtainable in mimeographed form from the IIEP.

Part I

Introduction to the model and its sub-system models

The first step in analyzing a system is to describe as specifically as possible the ultimate goal of that system. The system under study herein is 'teaching' and the aim of teaching is learning. At first sight, this might appear tautologous; however, the term 'teaching' often connotes a number of different roles. For example, teaching may be described as the actions of those who decide who is to be taught, or the actions of those who guide learners in face-to-face educational situations. Likewise, teaching frequently means moving pupils of a certain age from one grade to the next after exposing them to certain content in a given period of time. Sadly enough, teaching may sometimes be merely a means of classifying pupils. The intent of this project is to design a model which can be used to train teachers for work in primary schools in newly developed countries. The ultimate product of this proposed teaching model is the effective teacher who possesses particular abilities or competencies. More precisely, the effective teacher is an instructional manager, i.e., one who elicits appropriate changes in the behaviour of learners. The design of the model involves the use of instructional systems.

An instructional system is an empirically developed set of learning experiences which are designed to achieve, with a given degree of reliability, a given outcome for a given class of learners. Figure 1 (overleaf) presents a schematic representation of the major components of the model.

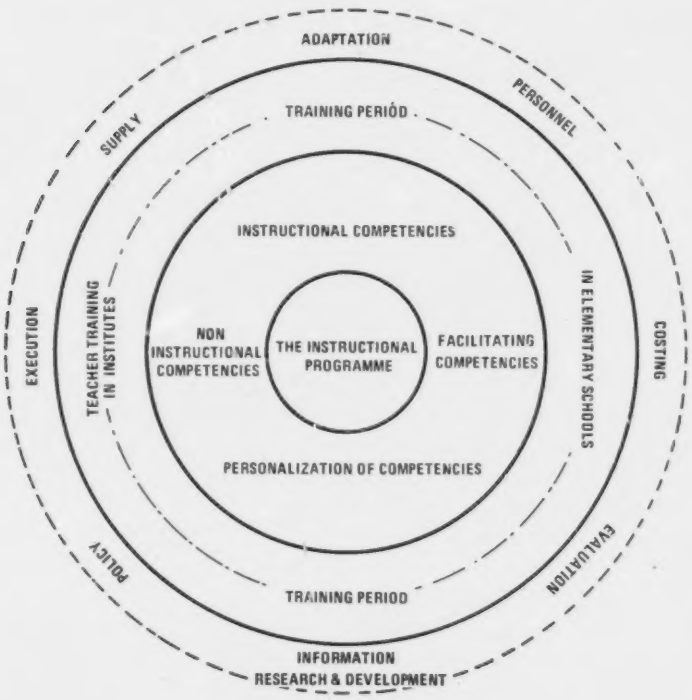

FIGURE 1. *Teacher-training model*

The three basic characteristics of the model are:

1. It is designed in such a way that it can be constantly adapted and corrected in the light of experience (see Figure 2).
2. It is designed to achieve a specific and measurable outcome.
3. It is designed so that it is *always* possible to foresee the outcome with relative accuracy.

To produce teachers with the qualifications needed in newly developed countries, that is, adaptive and self-directed career teachers, special effort must be devoted to making the training programme both practical and adaptable to various situations. Therefore, a conceptual framework of the model has been carefully worked out. This framework consists of two major subdivisions, one specifically for the instructional model as a sub-system. The management model is considered necessary, in addition to the instructional model, to ensure as far as possible that the *over-all* programme objectives are being achieved.

Each sub-system has specific operational directives which will be developed

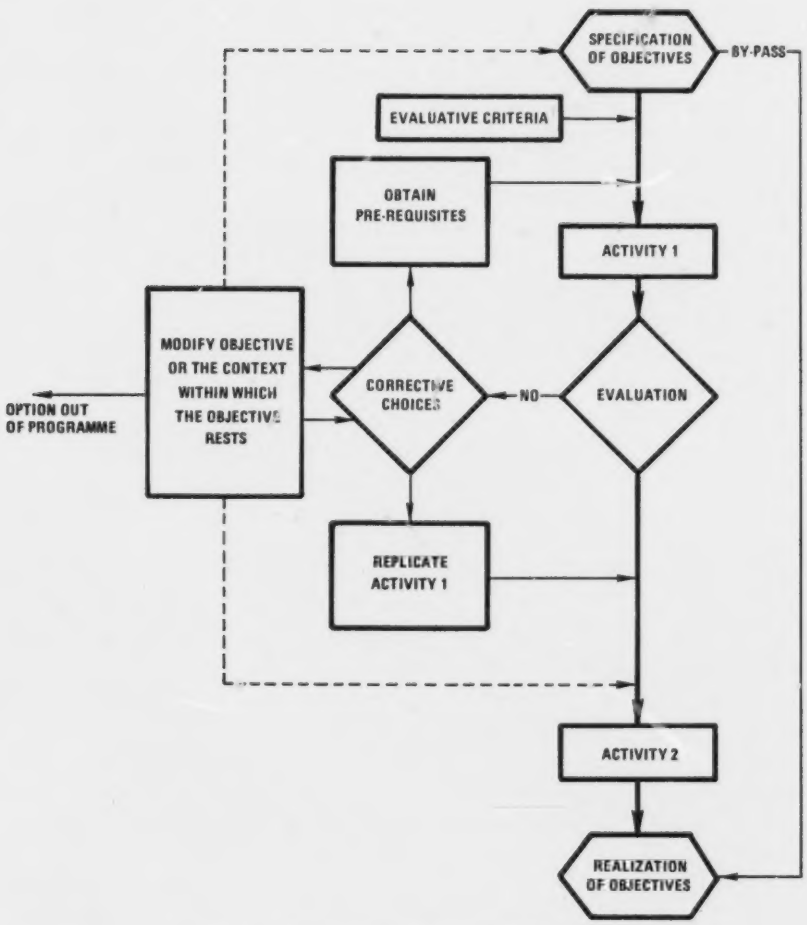

FIGURE 2. *Adaptive processes incorporated in the model*

more fully in the chapters that follow. These directives are listed below and together may be considered an outline of the framework of the teacher-training programme.

I. Instructional model sub-system

1. A decision has to be made to make use of systems design principles in teacher training.

2. The objectives of a teacher-training programme should be clearly defined in terms of the skills needed by teachers. In addition, that behaviour which is considered evidence of teaching competency should be spelled out so that it can be easily assessed.
3. The programme should be adaptable to the individual needs of each trainee in terms of his previous level of achievement, his rate of learning, and his particular subject preferences.
4. The programme should not be intended to produce stereotyped teachers. Instead, a prospective teacher must be expected to bring together all the various components that make up professional competence and from these develop a style best suited to himself.
5. Before actually being allowed to teach in a real classroom, the trainee must show under laboratory conditions his ability to bring about the desired learning by pupils.

II. Management model sub-system

1. A management model must exist side by side with the instructional model to ensure that, as far as possible, the objectives are being achieved.
2. Cost data should be provided for all operations within the model-based teacher-training programme as a whole.
3. The management model must be organized in such a way that functions within it will have as their aim the enhancement of instruction.

Section I

The instructional model

The instructional model is the first major sub-system of the teacher-training programme that will be discussed. It is interdependent with the management sub-system, but is considered of greater significance because within it lie the actual training functions of the programme.

This section consists of six chapters. The first one reiterates the instructional directives stated previously and lays down the initial guidelines for establishing the instructional model. The remaining five chapters are concerned with actual specifications and procedures involved in implementing the instructional model. Chapter 2 offers criteria for systematically analyzing what the content of a teacher-training programme should be. Chapter 3 presents a three-phase organizational set-up for the programme. Chapters 4 and 5 discuss the procedures for developing both instructional and non-instructional competencies in trainees, and Chapter 6 is concerned with the personalization of these abilities.

Chapter One

Development of the instructional model: rationale

The purpose of any model is to present an ideal and practical representation of an operation. Therefore, much effort was given to developing positive guidelines for the instructional model. These guidelines are referred to as directives.

1. *A decision has to be made to make use of systems design principles in teacher training.*

Every part of a teacher-training programme should be the result of systematic analysis and planning. The purpose of a teacher-training programme is to generate effective instructional managers, i.e., people who know how to promote learning among pupils. This is the basis for the evaluation of teaching and of teacher training itself. It is the first step in systematic analysis—knowing the objective.

Having decided upon this objective, the next step is to determine how to achieve it. In terms of systematic analysis this requires four interrelated steps:

1 Specify the desired pupil outcomes.
2 Specify the ways each outcome can be realized.
3 Specify the competencies needed by teachers to provide the conditions for the realization of each outcome.
4 Specify the ways the necessary teacher competencies can be developed.

Figure 3 is a diagrammatic representation of a curriculum developed according to these four steps.

The major objective of teacher training, of course, is to prepare teachers for instructional work. However, this does not exclude the necessity for other secondary objectives which contribute to the ultimate purpose. Teachers need additional, non-instructional competencies in order to perform effectively. For example, teachers have to confer with pupils and parents or may have to work

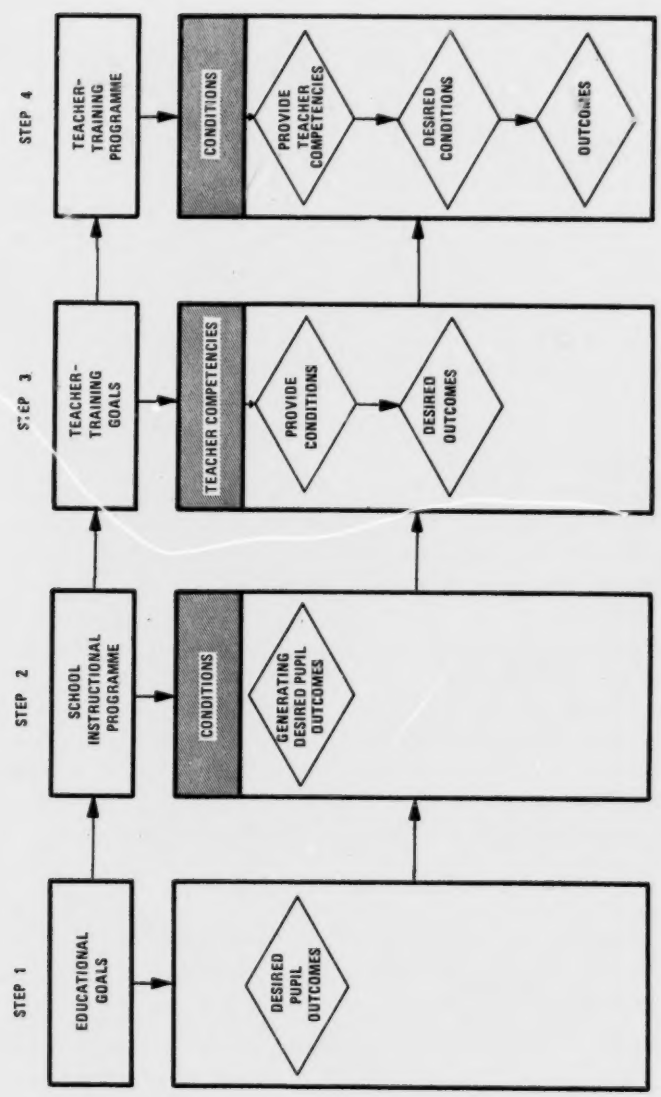

FIGURE 3. *Procedural model of the teacher-training curriculum*

in co-operation with research teams. Therefore, a further step in the systematic analysis of teacher training is the specification of these supporting functions and a determination of the instructional conditions necessary to effect them.

The content of the teacher-training programme is derived from the combination of those competencies, both instructional and non-instructional, which are decided upon. But this is not to be considered an irrevocable decision, because the factors involved are constantly changing, the desired pupil outcomes change, knowledge of the conditions bringing about these outcomes develops, supportive functions vary, etc.

Likewise, there are other determinants and these too may vary. Besides the systematic analysis of the learning content as established in the programme objectives, there must be a systematic structuring from the learner's viewpoint and an empirical development of learning experiences which enables the student to move through the structure in incremental steps. Thus, teacher-training programmes quite obviously must be designed to be flexible. This flexibility can only be developed if the student-trainee is constantly inter-acting with the programme, i.e., the media; this inter-action then must be observed, measured, and responded to systematically.

A systems approach makes use of all instructional strategies which contribute towards a given learning outcome. Special lectures, films, real-life settings, laboratory simulations and micro-teaching experiences are as much a part of instructional systems as they are of current educational practice. What is important is that they be organized to facilitate the development of explicit performance outcomes relating to explicit tasks to be performed by trainees.

Finally, in planning an instructional programme, it is not enough to consider merely present needs and desires, but account must be taken of the future needs and aspirations of society as well as the personal goals of individual trainees. Since there is no precise way to learn these things or to answer such questions about the future, the designer of teacher-training programmes must make assumptions that are at least arrived at systematically and logically.

2. *The objectives of a teacher-training programme should be clearly defined in terms of the skills needed by teachers. In addition, that behaviour which is considered evidence of teaching competency should be spelled out so that it can be easily assessed.*

It is essential to be able to evaluate the effectiveness of an instructional programme. The over-all objective must, therefore, be defined in terms of overt behaviour which may be considered evidence of competence. This behaviour then must be assessable by empirical observation.

A complicating factor in specifying acceptable behaviour for a programme

objective is that behaviour is always situation-specific. In practice this means that the content and strategy used in getting the trainee to elicit the acceptable instructional behaviour must always be defined in terms of the instructional setting to which he is exposed. The situation changes with each set of pupils, for each given pupil, and for different given (desired) pupil outcomes. To speak of an instructional act in the abstract, without considering the obvious variables, is meaningless. Any assessment of an instructional act must always be made with these variables in mind. Figure 4 illustrates the relationships involved in assessing an instructional act.

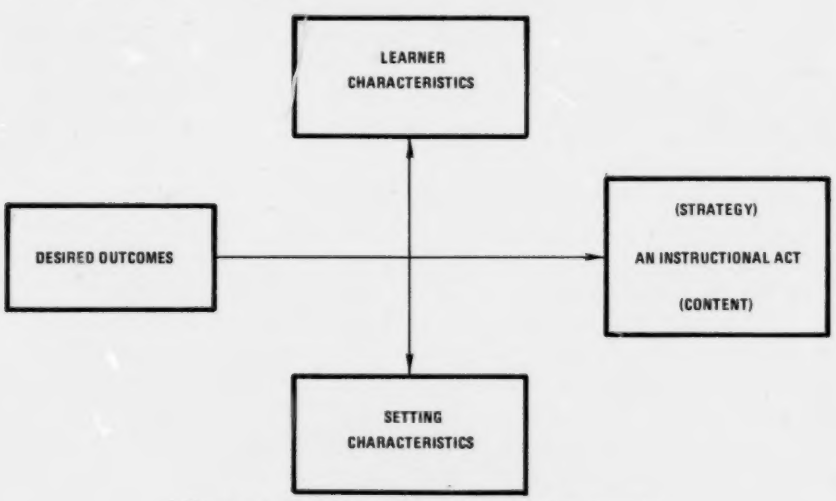

FIGURE 4. *Variables in the teaching-learning situation*

Similar variables and relationships are also involved, of course, when assessing the trainee's non-instructional acts.

3. *The programme should be adaptable to the individual needs of each trainee in terms of his previous level of achievement, his rate of learning and his particular subject preferences.*

It must be recognized that the individual learning patterns and performances of different trainees in any teacher-training programme will likewise differ. Consequently, there must be various levels at which the trainees may enter the programme and different paths along which they can move. The rate of progress through a system should be determined by the readiness of the trainees, and the sequencing of the instructional systems should be based as much on the respective abilities of the trainees as on the structure of the curriculum.

4. *The programme should not be intended to produce stereotyped teachers. Instead, a prospective teacher must be expected to bring together all the various components that make up professional competence and from these develop a style best suited to himself.*

Just as different individuals learn in different ways, so do different qualities go into making a good teacher. In planning a teacher-training programme, these differences must be encouraged in the expression of competencies and provision made to allow the trainee to integrate them into his own individual teaching style. The use of instructional systems does not mean that trainees should emerge as carbon copies of each other. While it is true that every trainee must be able to perform given teacher tasks, nevertheless, there are different ways of achieving this. This model proposes that each trainee decide which competencies are most appropriate for himself and that he should then develop them to *full* mastery.

This process is called the 'personalization' of teacher competencies, and refers to the process by which prospective teachers gain the needed instructional competencies, evaluate them, and finally integrate them into their own style. The model suggests that three provisions be made for the personalization process. These are that the trainee be encouraged and given the freedom to (1) develop an understanding of himself; (2) explore the value, meaning, or relevance of particular competencies for himself; and (3) develop an individual style of teaching.

Whenever a trainee is not developing as well as expected, he is re-routed through different channels in the model. In these channels, he may move freely or upon further diagnosis, he may be routed specifically through any one of a variety of corrective mechanisms. These mechanisms may range from conferences with a staff member or following a corrective sub-system, to recycling through the learning experience just attempted. The essential point is that a mechanism to facilitate the personalization process is always available and that its use is mandatory. Figure 5 is a diagrammatic representation of the personalization process in the model. For a more complete discussion of personalization, see Chapter 6 of this section.

5. *Before actually being allowed to teach in a real classroom, the trainee must show under both laboratory and supervised teaching conditions his ability to bring about the desired learning by pupils.*

It is basic to the instructional system that trainees should be able to demonstrate the appropriate teacher-competencies *before* assuming responsibility in the schools. First they are tested under laboratory or simulated conditions, and then

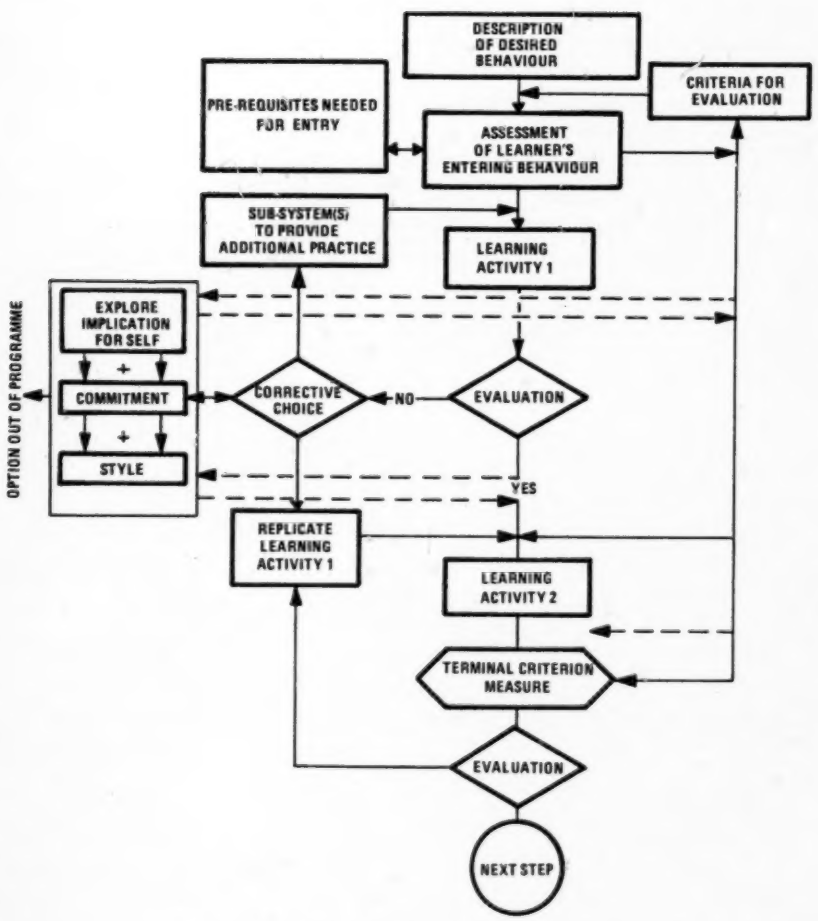

FIGURE 5. *Trainee's progress through the instructional system*

under supervised teaching conditions in a real classroom. Simulated situations provide the opportunity for controlling the complexity of the teaching-learning mechanism and for eliminating the danger of adverse effects on a trainee's future pupils.

Once a trainee has demonstrated his competence, even under simplified conditions, it is reasonable to assume that he can do the same under real classroom conditions.

However, before assuming sole responsibility for guiding the learning of pupils, the trainee must show under supervised classroom conditions that he

possesses a full range of teaching competencies, including non-instructional ones. In practice this means that a high percentage of the time allowed for teacher training must be spent in the supervised classrooms. Consequently, this also means that competent teachers already in the schools must be trained to carry out the necessary supervision.

Such a system entails a great responsibility on the part of the schools in the planning and operation of a teacher-training programme. This, combined with the changes which the adoption of instructional systems means for the teacher-training institutions themselves, implies fundamental changes in the organization and operation of any current national teacher-training programme.

Chapter Two

Content specifications

So far we have discussed broad guidelines for establishing a teacher-training programme which uses an instructional systems model as its framework. These guidelines, or directives, have indicated the general nature of the instructional programme. They have not, however, dictated *how* the programme should be implemented, *when* particular activities or functions should occur or *what* the content should be for the various aspects of the programme. That is the purpose of *specifications.*

Specifications have been developed for the instructional model so that it can be used to establish parameters for actual teacher-training programmes. Eventually these *model specifications* have to be translated into *programme specifications* for the actual operation of a programme, but that is a level of detail outside the scope of this project.

This chapter deals only with content specifications.[1] Two of the specifications refer to the two distinct roles a teacher has in performing instructional and non-instructional tasks. The other three specifications refer to content considerations relevant to both roles. Before specifying the content necessary for preparing the trainee for these teacher roles, analyses must be made of (a) the tasks to be carried out within each role, and (b) the competencies needed to perform each task. In this way, a systematic approach is maintained for this level of the model's development. The specifications have been arranged numerically (as were the operational directives) and are as follows.

1. Chapter 3 discusses organizational specifications for the instructional model. Chapters 4 and 5 are concerned with the actual procedures required to develop a trainee's instructional and non-instructional abilities. Specifications for the management model have also been developed and will be discussed in Chapter 2 of Section II.

1. *Content should be designed to prepare prospective instructional managers for their role as facilitators of desired outcomes in pupils (Role I).*

The task analysis for Role 1 of the prospective instructional manager should clarify the *classes* of pupil outcomes which are to be realized. For use with a model, these need to be defined rather broadly since educational institutions are likely in the future to assume more and more responsibility for the development and over-all well-being of pupils. It is critical, therefore, that prospective instructional managers be aware of and committed to effecting the full range of outcomes necessary for pupils to reach their full potential. These outcome classes obviously extend beyond the three Rs. For the purpose of this analysis, most outcomes fall into the three familiar classes of cognitive, affective, and psychomotor outcomes. In addition, concern must be shown for effecting outcomes related to general health, emotion, identity, aggressiveness, tenderness, and all the other qualities that lead to human development.

Given the desired pupil outcomes, or at least the classes of these outcomes, an analysis of the competencies needed to bring them about should be undertaken. The purpose of this analysis is to identify the competencies themselves and to discover the conditions of learning which those competencies must provide.

While the rationale for a competency analysis is straightforward, the available information needed for a complete analysis is, unfortunately, insufficient. With a few exceptions, educational and behavioural science literature is lacking in the kind of tested, empirically based evidence which permits, to any degree of confidence, an identification of the conditions or operations that give rise to specific classes of pupil outcomes. It is difficult, for example, to identify clearly and with confidence the instructional conditions which promote concept learning, attitude modification, or anxiety reduction in pupils. It is even more difficult to pinpoint the conditions necessary for developing trust, or self-understanding, or even self-confidence. In every case, the problem is compounded because the conditions necessary for the realization of any outcomes vary somewhat for any particular kind of learner in a particular kind of instructional setting. As a result, for the proposed model, an alternative strategy was pursued to identify the content related to the instructional competencies needed by teacher-trainees.

The strategy has two levels. The first level involves specifying a model of instruction and deriving from the model the measure of knowledge needed to perform effectively within it. For this study, a relatively precise model of the instructional process was used as a guide in developing content. The model holds, in effect, that any instructional act depends upon the interaction of the following variables: (a) the desired pupil outcome; (b) the characteristics of

the learner(s); (c) the characteristics of the instructional setting; and (d) the nature of the instructional act[1] *per se*.

At the second level, trainees are expected to have mastery of the knowledge specified by the model and, with practice, to be able to apply it effectively to instruction in an on-going educational setting. In practice this means that a prospective instructional manager must demonstrate his ability to operate with appropriate combinations of the four above-mentioned variables under both simulated and live conditions; i.e., he has to demonstrate both in the laboratory and in a supervised classroom with pupils that he can effect desired pupil outcomes.

The content derived from the analysis of Role 1 can be placed into four classes: learner outcomes, learner characteristics, the element or strategies of the teaching act, and the conceptual framework through which subject-matter can be taught. As assumed in the model, conceptual frameworks represent bridges between the nature of the subject-matter (as obtained outside the professional educational programme) and the strategies for teaching it.

Figure 6 is a schematic analysis of the content relevant to the development of competencies needed to perform Role 1.

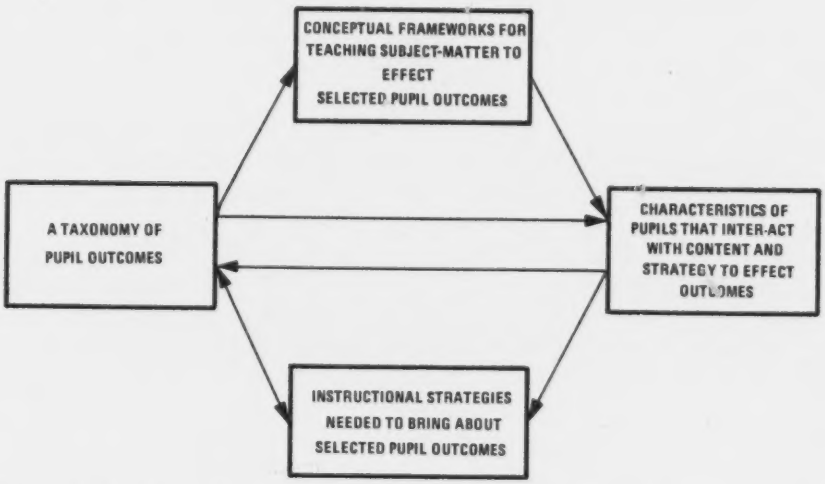
CONCEPTUAL FRAMEWORKS FOR TEACHING SUBJECT-MATTER TO EFFECT SELECTED PUPIL OUTCOMES
A TAXONOMY OF PUPIL OUTCOMES
CHARACTERISTICS OF PUPILS THAT INTER-ACT WITH CONTENT AND STRATEGY TO EFFECT OUTCOMES
INSTRUCTIONAL STRATEGIES NEEDED TO BRING ABOUT SELECTED PUPIL OUTCOMES

FIGURE 6. *An analysis of content in the instructional model concerning desired pupil outcomes*

1. As used in this model, the term 'instructional act' refers to the behaviour of an instructional manager in effecting pupil outcomes. It includes both the content presented and the strategy used.

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2. *Content should be designed to prepare prospective instructional managers for their role as performers of certain non-instructional tasks (Role 2).*

The content for Role 2, like that for Role 1, must be derived from analyses of the tasks required of that role and of the competencies needed to perform those tasks.

The instructional manager of today is responsible for certain non-instructional tasks which have always been considered part of the teacher's role and which will probably be included in that role for many years to come. These tasks are necessary for the efficient functioning of the classroom as an educational setting and, consequently, for the general well-being of pupils. They include, for example, administrative functions such as record-keeping; management of various school facilities, materials, supplies, etc.; discussions and counselling with pupils and parents; and work with professional educational organizations. These are traditional tasks, but new tasks are evolving as society changes and more is learned about the teaching act and about learning itself.

Simply because education as an institution and educational practices are changing very rapidly, one can only make informed conjectures about what the responsibilities of teachers will be even in the near future (see, also, content specification number 5). Along this line, some major changes in education have been predicted which will affect the responsibilities of the teacher. For Role 2 functions these will be reflected by: (1) increased responsibility for research and evaluation within on-going educational programmes; (2) increased individualization of instruction through use of pre-designed instructional systems, media, and technology; (3) increased reliance upon para-professional assistants and instructional aids; and (4) responsibility for participation in administrative decision/policy-making, curriculum planning, and school management.

Through such an analysis, planners of teacher-training programmes should be able to decide what content will be relevant to the various tasks of Role 2.

Once these tasks have been brought to light, an analysis should be made of competencies needed to perform them. Since Role 2 tasks can be defined only in general terms, however, the analysis of abilities needed to perform Role 2 tasks involves a somewhat different method from that used for Role 1. Rather than using well-defined outcomes as points of departure and letting competencies be dictated by what is known empirically about the conditions required to effect these outcomes, Role 2 competencies can be expressed only in an outline that is just as general as the Role 2 task analysis. For example, it would be extremely difficult to decide precisely what competencies would be needed to work in co-operation with a research team or to supervise an instructional assistant. It must be realized, therefore, that Role 2 competencies serve a broad range of related functions rather than relatively specific ones.

The content relevant to the development of competencies needed to perform Role 2 tasks is summarized schematically in Figure 7.

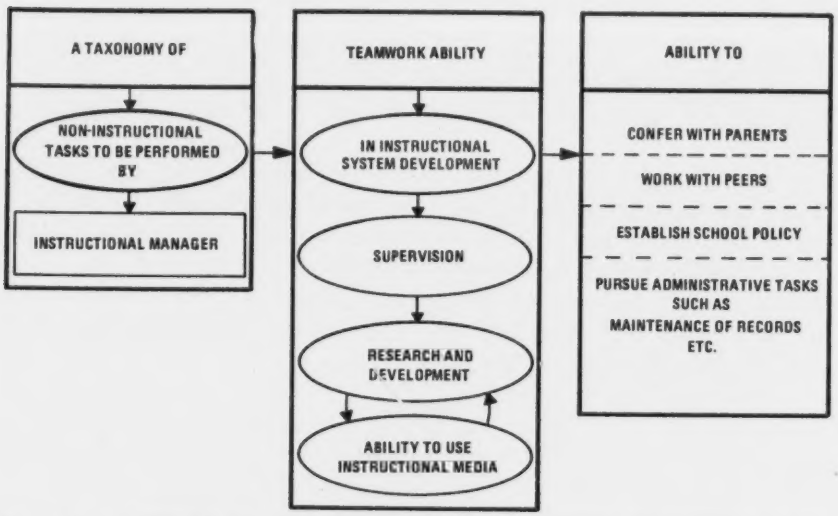

FIGURE 7. *A summary of content in the instructional model concerning the performance of non-instructional tasks*

3. *Content should be designed to develop general-purpose skills that can enhance, or facilitate, the application of professional abilities.*

The day-by-day performance of Role 1 tasks is largely dependent upon the general adaptive ability of the individual instructional manager. More precisely, it is his ability to collect and process information, to develop hypotheses, to implement and test the most promising of these, to act upon the data arising from tests, etc., and to interact with students individually and in groups. Generally speaking, inter-personal competence depends upon general communication skills, the group process skills, conflict management, etc. The performance of Role 2 tasks carries the same requirements. Thus in performing Roles 1 and 2, instructional managers need general-purpose competencies that enhance or facilitate those described previously. Figure 8 is a schematic analysis of content relevant to developing skills which enhance or facilitate the application of competencies needed for Roles 1 and 2.

FIGURE 8. *An analysis of content in the instructional model concerning inter-personal competencies*

4. *Content should be designed to provide for the personalization of all competencies.*

Three factors are considered essential to the personalization process: (a) the development of self-understanding; (b) clarification of the commitment necessary for the full development of various professional competencies; and (c) integration of professional competencies into a unique and personally suited teaching style. The personalization process involves two steps. The first step is in the form of an instructional system which contains sets of experiences which parallel experiences in the instructional systems designed to develop professional competencies. This step is concerned with the development and initial understanding of oneself, one's value structure and one's orientation toward a particular teaching style.

The second step asks that the trainee develop his professional competencies so that they will reflect and be consistent with the personal realizations that emerge in the first step.

Figure 9 is a schematic analysis of the content relevant to the personalization of competencies. A further discussion of the personalization process will be presented in Chapter 6 of this section.

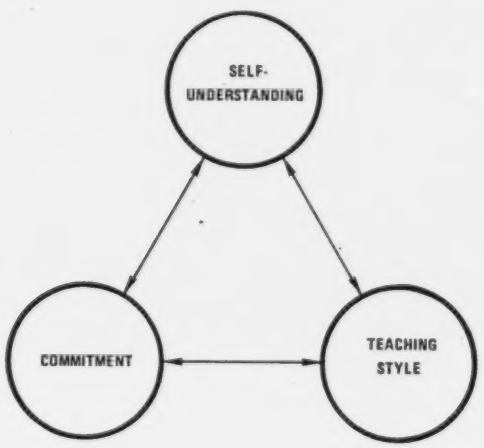

FIGURE 9. *An analysis of content in the instructional model concerning the personalization of professional competencies*

5. *Content should be designed to prepare instructional managers for the future.*

In order to plan an instructional programme meaningfully, some statement has to be made about the expected nature and purpose of education during the next ten years. This was touched upon in specification number 2. Most educationalists are at least in agreement about two predictions; these refer to current developments or trends which most likely will have long-range impact.

The first is that a functional science and technology of education will evolve, and it will bring with it an educational programme that is markedly different from that which is now found in most schools. Two developments are anticipated: (a) the widespread use of prepared materials for individualized instruction, and (b) the application of systems technology in the design of instructional experiences. Out of both will grow the application of 'instructional systems' to the education of children.

The second prediction foresees three major classes of educational specialists. These are: (a) instructional analysts; (b) instructional designers; and (c) instructional managers. As conceived at present, the instructional analyst will be that member of the instructional team primarily responsible for identifying the classes of pupil outcomes for which the school should be responsible, and the instructional conditions necessary to bring them about. The instructional designer will have the task of developing instructional systems to effect these outcomes. The instructional manager will bring the effort of the other two to bear upon the educative process. The task of the instructional manager is viewed as one of creating and/or maintaining an instructional environment that brings about learning in children. The instructional manager's specific function within the school is likely to be primarily that of a supervisor/manipulator. In practice this means that the instructional manager of the future will have two responsibilities. The first is that he will have to be able to diagnose learner readiness, prescribe appropriate learning experiences, evaluate their effectiveness and prescribe subsequent learning steps. Secondly, he will have to be able to apply the instructional systems developed by the other members of the educational team, supervise instructional assistants, etc. Figure 10 shows a schematic analysis of all the content groups included in the instructional model.

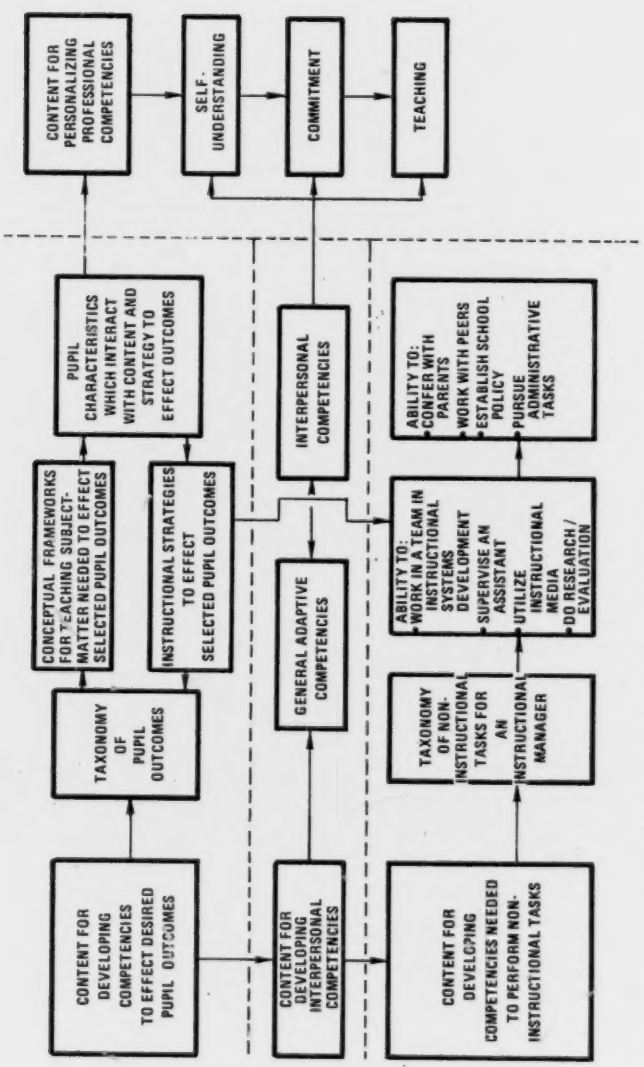
CONTENT FOR DEVELOPING COMPETENCIES TO EFFECT DESIRED PUPIL OUTCOMES
CONTENT FOR DEVELOPING INTERPERSONAL COMPETENCIES
CONTENT FOR DEVELOPING COMPETENCIES NEEDED TO PERFORM NON-INSTRUCTIONAL TASKS
TAXONOMY OF PUPIL OUTCOMES
GENERAL ADAPTIVE COMPETENCIES
TAXONOMY OF NON-INSTRUCTIONAL TASKS FOR AN INSTRUCTIONAL MANAGER
CONCEPTUAL FRAMEWORKS FOR TEACHING SUBJECT-MATTER NEEDED TO EFFECT SELECTED PUPIL OUTCOMES
INSTRUCTIONAL STRATEGIES TO EFFECT SELECTED PUPIL OUTCOMES
PUPIL CHARACTERISTICS WHICH INTERACT WITH CONTENT AND STRATEGY TO EFFECT OUTCOMES
INTERPERSONAL COMPETENCIES
ABILITY TO: • WORK IN A TEAM IN INSTRUCTIONAL SYSTEMS DEVELOPMENT • SUPERVISE AN ASSISTANT • UTILIZE INSTRUCTIONAL MEDIA • DO RESEARCH / EVALUATION
ABILITY TO: • CONFER WITH PARENTS • WORK WITH PEERS • ESTABLISH SCHOOL POLICY • PURSUE ADMINISTRATIVE TASKS
CONTENT FOR PERSONALIZING PROFESSIONAL COMPETENCIES
SELF-UNDERSTANDING
COMMITMENT
TEACHING

FIGURE 10. *An analysis of the major blocks of content in the instructional model*

Chapter Three

Organizational specifications

Three organizational specifications have been developed for the instructional model to clarify *how* the teacher-training programme is to be set up. The first delineates specific phases for the programme organization; the second explains how content will be integrated into the programme; and the third discusses how the organization of the programme must be in agreement with general educational and institutional requirements.

1. *The instructional programme should be organized into three phases; i.e., a foundations phase, a laboratory phase, and a practicum phase.*

These three phases of foundations, laboratory, and practicum have been established because four major activities dominate an instructional programme model. These are:

1. Demonstration of mastery of the basic knowledge pre-requisite to the development of instructional and non-instructional competencies (foundations phase).
2. Demonstration of instructional and inter-personal competencies under simulated classroom conditions (laboratory phase).
3. Demonstration of instructional/non-instructional and inter-personal competencies in an actual (supervised) classroom (practicum phase).
4. Demonstration that all the knowledge, competencies, and abilities required of the career teacher have been integrated into a unique and personally relevant teaching style (inter-phasic).

In general, the first three activities follow one another in time; i.e., the foundations phase precedes the laboratory phase, and the laboratory phase precedes the practicum phase. The fourth activity, personalization, is involved in all three phases and is a continuing process. The phases do *not* have to be in a rigidly fixed sequence, however, for the programme is structured in such a way that trainees may begin to work towards mastery of a competency while

attempting its performance in the laboratory. The basic principle underlying the integrative relationship between the foundations and the laboratory phases is simply one of recognizing individual differences in trainees. Empirical evidence will reveal how each trainee learns best.

The relationship between the practicum phase and the other phases is not as flexible, however, as the relationship between the foundations and the laboratory phase. While the trainee may continue some foundations work or may recycle into certain laboratory experiences after entering the practicum phase, there is generally a rather rigid line between the practicum and the laboratory phases. Passage into the practicum phase is dependent upon criterion performance; if the trainee is able to meet the criteria for designated competencies when he enters the programme, nothing should prevent him from moving immediately into the practicum phase. If, on the other hand, he is consistently unable to reach criterion performance, he will *never* enter the practicum. This is the case, no matter how long he is allowed to remain at the foundations-laboratory level.

In every case, trainees must demonstrate competency in effecting appropriate outcomes in pupils under simulated classroom conditions before they are allowed to assume this responsibility under real-life conditions. This is the case even though supervision occurs in the practicum.

This requirement of competency demonstration in the laboratory before

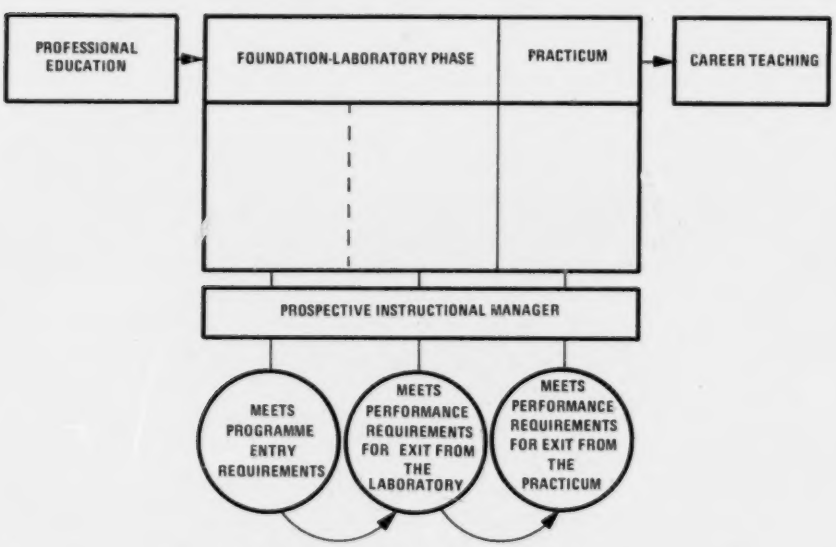

FIGURE 11. *A model of the relationship between the foundation, laboratory and practicum phases*

entry into the practicum phase has implications about progress through the entire programme: the instructional model programme is a performance programme and not a time- or cause-dependent one.

The practicum also requires performance to criterion before the trainee can be recognized as a qualified career teacher. As in the other phases, time or credit hours bear no direct relationship to progress through the practicum phase. It is different from the laboratory, however, for it is possible for a prospective instructional manager to remain in the practicum phase indefinitely; the only requirement for his remaining there is a school's willingness to continue supervision.

The relationship between the foundations, the laboratory, and practicum phases of the programme is illustrated in Figure 11.

2. *The content of the instructional programme should be arranged systematically into phases.*

The major content groups that are developed within the instructional model must be arranged in a manner that is directly related to the sequence of activities established by the phases of the programme. This simply means that certain content will be introduced or covered at one specific time, that the trainee will have to demonstrate mastery of subject-matter content or skills at another specific time, and so forth. By and large, this set-up follows the logic that underlies movement from the foundations phase to the laboratory to the practicum phase. Figure 12 illustrates the organization of content within the framework of the instructional model.

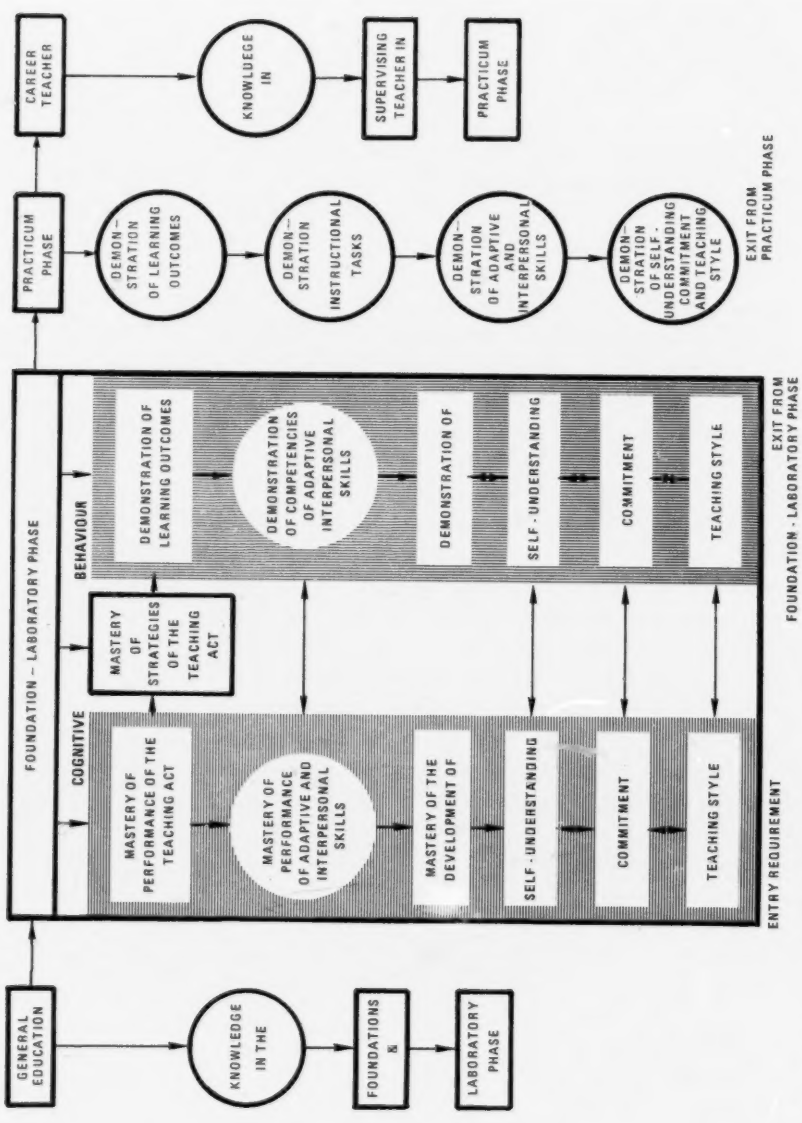

FIGURE 12. *The organisation of the major content of the instructional model*

3. *The three phases of the instructional programme should be integrated functionally within the general educational requirements and within the in-service educational requirements of the teacher-training institute.*

Any professional educational programme must fit within the constraints of the institutions in which it exists. In an institutional setting the goals and activities of the laboratory and foundations phases must concur with the general educational requirements of the teacher-training institute. Within this whole setting, the practicum programme must fit in with the practical demands of instruction. If followed as planned, a model programme should present no great difficulties on either count. If the programme is set up to be completed within a period of four years, it is assumed that on the first level trainees will need to spend one-third of the time obtaining teaching certification. At the second level it is assumed that, on the average, trainees will spend two or three years in the practicum phase. During this time, trainees will be employed as 'interns'. As such, it is assumed that within a reasonable period of time, these semi-professional teachers will return as much to a school as they take from it.

One major complicating factor in the programme is that the success of the practicum phase depends upon the availability of qualified supervisors in the schools. The supervising teacher must be able to judge criterion standards and to instruct or advise in order to bring trainee behaviour up to criterion standard when it is below. In a systematically designed performance-based programme, these are demanding requirements. As a consequence, one of the major tasks facing institutions implementing any model programme is the preparation of teachers in the schools who can act as supervisors in the practicum programme. The basic skills required by a supervisor in the practicum can be inferred from the description of the basic training model for the practicum; e,g., trainee outcomes can be utilized to analyze the tasks and competencies needed by a supervisor to effect those outcomes.

Chapter Four

Procedures for the development of instructional abilities

As has been stated previously, the ultimate product of the teacher-training programme model is the instructional manager who is able to elicit appropriate changes in the behaviour of pupils. Chapter 3 presented the three phases (foundations, laboratory, and practicum) through which the trainee must pass to become an officially qualified teacher. This chapter, and the following chapter on the development of non-instructional abilities, discuss in greater depth the procedures for implementing the above three phases.

The trainee who goes through the properly planned and executed programme should emerge as an effective, committed, self-adapting, and professional teacher. Before being admitted to the programme, however, the candidate trainee must possess certain pre-requisite abilities. These pre-requisite abilities are referred to as the trainee's entry behaviour. It is entry *behaviour* because it is the observed evidence of the knowledge and skills a trainee has and/or needs to ensure success through the foundations phase of the model programme.

Once in the foundations phase, the trainee is exposed to the wide range of experiences needed for judging the nature of learning activities in schools. These experiences help develop the trainee's abilities to recall and use knowledge of the relevant content fields of elementary teaching, of the desired learning outcomes, and of the characteristics of the learners that will be confronted.

After the foundations phase, the trainee enters the laboratory phase where under simulated conditions he must successfully demonstrate competencies in all significant aspects of teaching. The instructional systems of the laboratory phase provide the trainee with opportunities both to acquire knowledge about the variables of teaching, and to use this knowledge through practice under laboratory conditions.

The final stage, the practicum, is practice teaching under actual classroom conditions. Here the trainee develops and strengthens the competencies he acquired in the laboratory and foundations phases. In this phase the variables

of the teaching act are integrated into a continuous pattern of teaching behaviour. In effect, the instructional manager practises or re-enacts the experiences which he had in the laboratory. In the practicum the trainee progresses through a sequence of stages in which, as he acquires more responsibilities and is given more complex assignments, he is also given the opportunity to demonstrate his increasing capability. In the practicum, the trainee synthesizes the behaviour he has learned by performing certain tasks plus giving rational explanation for his particular teaching behaviour in terms of accepted teaching theories.

Ultimately the trainee should demonstrate not only technical competencies but a commitment to continuing self-education. Upon graduation, the trainee, now professional teacher, should be recognized as an adaptive decision-maker who possesses both technical competence and a broad base for making instructional choices. Officially this recognition should be in the form of a certificate or diploma and eventual placement of the new graduate in a teaching position.

The above review has shown the programme in its entirety; this now calls for a more detailed discussion of the different stages of the programme.

The nature of entry behaviour

Entry behaviour is not an actual phase in the programme, but it is an assessment of the trainee's abilities and knowledge before entering the programme. Entry behaviour is characterized by the trainee's abilities to record facts, use this information, or demonstrate basic skills which are essential for success in the instructional systems of the foundations phase of the programme.

The model does not dictate *how* entry behaviour is to be acquired; it is assumed that individual trainees will have different backgrounds and may acquire their entry behaviour in a variety of ways. For example, one may learn a basic history vocabulary from an initial course in the teacher-training programme, while another may have gained such knowledge from high school study. A trainee may also have acquired the requisite behaviour by studying self-instructional material.

As was stated before, entry behaviour is the observed evidence of the trainee's skills and knowledge. This definition of entry behaviour greatly influences the general educational aspects of the model programme. To some extent, the entry behaviour needed for each system of the foundations phase will determine what is to be considered 'general education'. In most cases, the trainee will have to rely on liberal arts courses for much of his entry behaviour. The model makes provision for these liberal arts courses so the candidate can meet all requirements for professional competence, while remaining in the main-stream of the teacher-training programme. This means that the professional programme

will constitute a third to nearly half of the total teacher-training programme. The remainder will be devoted to providing a broad liberal education in which the candidate can meet all the requirements for participation in a specific teacher-training programme. One of these requirements, in particular, is that the trainee has some concentrated study within an academic major field or an interdisciplinary major field.

While the liberal arts or general educational components of the basic programme serve a fundamental function in the model, it is beyond the basic scope of the model to make specifications for the 'academic major' functions. The goal of the model is to produce instructional managers. However, instructional management is only the initial role of the professional educator; his other roles, which may require more responsibility because of their complexity, might include that of an instructional designer or an instructional analyst. In order to be prepared for these roles, the trainee must specialize in an academic area at the same time as he acquires competence in instructional management. The degree to which an academic major is pursued serves as the basis for the specialization needed for the future roles of instructional designer or instructional analyst. Later study in the major field may enable instructional managers to take on even more responsibility for instructional design. In every case, the academic major is not only a requirement for the liberally educated teacher, but it must be a planned component in the programme for elementary educators who may wish to advance to higher career roles.

It is difficult to say what components of a teacher-training programme will be essential to the elementary instructional manager of the future. At present, the instructional manager must at least be able to make decisions and determine objectives in all content fields in the elementary curriculum. Therefore, certain procedures should be followed to establish a systematic method of selecting candidates for the programme and to provide for the definition of behaviours which are essential to trainee success in achieving the objectives of each foundation system. Briefly, these procedures are:

1. The programme should provide for the definition of the traits which are considered pre-requisite to the initial learning activities in each foundation system. These traits, which are derived from an assessment of the behaviour of the teaching population, should be considered criterion behaviour for the model programme. A formal list of these enabling behaviours should then be established and utilized.
2. The programme should provide a list of entry behaviours for the sub-systems on self-understanding, describing personal characteristics needed for success.
3. The programme should provide for the definition of both cognitive and affective entry behaviours, so that evidence of these behaviours may readily be demonstrated by overt, measurable acts.

4. The programme should provide the candidates with a means of demonstrating entry behaviour for the foundations systems concerned with learning characteristics, learning outcomes, and at least one conceptual framework of a teaching area.
5. The programme should provide the candidates with means for completing the instructional systems concerned with learning characteristics, learning outcomes and a conceptual framework of a teaching area.
6. The programme should provide a means for assessing entry behaviour, to permit candidates to enter particular foundation systems at different times.

Procedures for the foundations phase

Once criterion behaviours are established and the trainee is admitted into the programme, he begins developing those behaviours in the foundations phase. The purpose of the foundations systems is to provide the trainee with experiences which will enable him to judge the appropriate nature of pupil responses. In other words, these foundations systems are the bases upon which the trainee makes his instructional decisions. If ideal conditions for testing a trainee's knowledge in a teaching situation with children could be consistently arranged, it would be the most effective time for the trainee to acquire foundations knowledge and skills. However, since such conditions are not always possible, the trainee must acquire some knowledge and skill beforehand. This is the purpose of the systems within the foundations phase. For each instructional system in the foundations phase, criterion behaviours for the trainee should consist of both cognitive and affective dimensions. The instructional systems will also require the trainee to demonstrate his ability to recall and use knowledge in a particular foundations field and to place a value upon the acquisition and use of his knowledge.

In implementing a model programme, the programme's designers must choose the knowledge or skills which are essential for the trainee instructional manager. The model considers these decisions tentative and relevant only at a certain point of time for any given input of information in any given foundations field. Programme designers must also define systems objectives and describe the acceptable behaviour of the instructional manager who is communicating particular subject-matter concepts to particular classes of learners. This general guideline is intended to ensure the relevance of the foundations systems to the elementary educational curriculum and learning concepts.

The foundations phase, then, consists of various systems which are necessary to acquire knowledge about (1) learning, (2) basic content, (3) characteristics of learners, and (4) learner outcomes.

Learning

Concerning learning, these systems should provide knowledge about the nature of learner responses to a teaching act. At least three characteristics should be pointed out:

1. The response is invariably an example of a particular class of learning behaviours (e.g., cognitive, affective, or psychomotive and complex or simple).
2. Any response always has some content or subject-matter quality.
3. A response is always a unique communication act particular to any given learner, because sociological and psychological backgrounds make each learner different.

Basic content

Concerning basic content, the systems of the foundations phase should provide a broad range of knowledge to be acquired by the trainee. This knowledge should relate directly to the behavioural objectives expected of trainees in the teacher-training programme, since these objectives are not synonymous with those in comparable subject-matter courses in liberal arts departments. For example, the mathematical concepts to be acquired by the trainee in the model are not purely mathematical in nature but consist of the methodology of teaching mathematics to young pupils; i.e., what must the teacher be able to recall and understand about mathematics and how should he teach it to pupils?

Therefore, the programme should provide for the definition of those concepts which the trainee requires in order to judge how appropriate the behaviour is in various content fields. These content fields include: (1) reading and language skills, (2) foreign languages, (3) natural sciences (including health sciences), (4) mathematics, (5) social studies, (6) physical education, (7) fine arts and applied arts, and (8) music.

It is unlikely, however, that the all-purpose, self-contained classroom will continue to be the basic unit of the elementary instructional programme. Future instructional managers will probably be required to have considerably more depth, but in fewer academic areas. However, for the present, it seems imperative that the instructional manager should have some level of knowledge and competence in each of the above content fields. Therefore, only those concepts are selected for foundations which: (1) are concerned with communicating content in the above fields; and (2) relate to behaviour defined by the authorities as appropriate for elementary pupils.

Having established content-related concepts for the foundation systems, the programme should state the acceptable behaviour which constitutes evidence of a trainee's ability to acquire and use these concepts. (These statements

become the objectives for an instructional system.) The trainee behaviours should be based on: (1) the extent of knowledge needed, and (2) willingness to demonstrate desired behaviour in each content field.

Finally, with reference to content in the foundations phase, the programme should provide for instructional systems which allow the trainees to demonstrate appropriate behaviours for the various content fields.

Characteristics of learners

Concerning the characteristics of learners, the systems of the foundations phase should provide knowledge about:

1. The physical, social and mental characteristics of learners of both sexes and of all ages.
2. Experiences in which the trainee observes and participates in teaching-learning situations, both formal and informal, with pupils from different economic backgrounds or social classes.
3. Components which require the trainee to make tentative decisions concerning the age of pupils he prefers to guide and the school settings in which he prefers to work.
4. Components which allow the trainee to demonstrate his own characteristics as a learner; this includes his abilities to recall and use concepts, to describe his own behaviour as evidence of self-understanding, and to verbalize his own anticipated outcomes for each set of objectives or system in his phase.
5. Components with behavioural objectives based on concepts selected by authoritative specification and which refer to the various classes of learner characteristics.
6. Components with behavioural objectives concerned with the application of knowledge of learner characteristics.
7. Components with behavioural objectives concerned with revealing the value the trainee places on his knowledge about learner characteristics.

Learner outcomes

Concerning learner outcomes, the systems of the foundations phase should provide objectives which describe:

1. A universe of classes of learning outcomes; e.g., taxonomies of cognitive, affective and psychomotive behaviours.
2. The appropriate trainee behaviour for selecting complex and simple outcomes and affective, cognitive and psychomotive outcomes.
3. The application of the knowledge of learner outcomes gained by the trainee.

These systems are unique in that they should provide the trainee with both

knowledge and a set of values which will enable him to design objectives for pupils at various levels of complexity. In a sense, this requires the trainee to synthesize his knowledge of the various classes of learning outcomes and to determine the effects of information on learners in a more personal and creative manner.[1]

Procedures for the laboratory phase

The laboratory phase is the core of the instructional programme. In the laboratory, the trainee should be provided with opportunities to practise the behaviours which are essential to effective instructional management. Criterion behaviour for the systems of this phase is evidenced in the practice of those essential behaviours to a level of acceptability. The systems embody both new media and conferences with the academic staff, with administrative personnel, and with the trainee's classmates. Procedures for the laboratory phase are as follows.

First of all, the programme should provide an analysis of the behaviours of the effective instructional manager. This analysis should utilize systematic techniques in order to (1) describe behaviours which are supported by research into teaching, and (2) identify specific 'tasks' related to those behaviours.

Once these tasks have been identified, they should be stated in behavioural terms; i.e., performance standards should be defined for each task objective and tasks should be logically related to each other. Typically, later tasks should summarize earlier tasks and a composite of all the tasks should provide evidence that the trainee is able to demonstrate all the essential behaviours.

The programme then should provide for the design of instructional systems to produce the behaviour identified in each task. These instructional systems should (1) communicate the desired behaviour to the trainee; (2) pre-assess and identify the entry behaviour of the trainee; (3) separate each task into component activities and incremental steps;[2] (4) provide various opportunities for the student to demonstrate criterion behaviour; (5) provide an assessment procedure for each component activity; and (6) provide at each assessment, and at pre-assessment, alternative activities to accommodate for different levels of behaviour.[3]

1. The author believes that this 'synthesis' of knowledge best describes what is involved in the process of judging learner outcomes. It is also realized that it presents a somewhat different view from those described in existing literature.
2. Media are selected to implement component activity.
3. Among the alternatives, the system should provide the means by which the trainee may check, with other trainees, the value he places on each task.

In addition to requiring evidence of technical efficiency, the systems of the laboratory phase should require the trainee to demonstrate his abilities to judge the appropriate nature of the learning behaviour which he establishes for his pupils. In other words, the criterion behaviour for defining teaching objectives includes the provision that the trainee should prepare objectives which relate to appropriate pupil behaviour in the following ways: (1) the desired pupil behaviour must be consistent with current, authoritative descriptions of content fields; (2) the objectives must be designed to permit pupil success; (3) the objectives must be examples of specific taxonomic levels and domains, i.e., of specific classes of learning outcomes; and (4) each objective must be one of a set of objectives which shows various levels within various domains of behaviour.

The systems in the laboratory phase, therefore, must provide a means for evaluating the trainee's ability to implement his objectives in accordance with all the above criteria.

The various components of the laboratory systems should always include examples of behavioural models with which the trainee may compare his own behaviour. These examples may be verbal, mediated or real performances by instructional managers, and they should include variables to show different styles by which the instructional manager may perform each inter-action behaviour effectively.

Finally, for the instructional systems of the laboratory phase, the criterion level of behaviour should at least be at a level equal to the average performance of a given group of trainee-instructional managers. This criterion level is considered the appropriate entry behaviour for the practicum phase.

Procedures for the practicum phase

The practicum phase provides instructional systems in which the trainee continues training to develop specific teaching competencies and to acquire additional ones necessary for the career-teacher.

In the practicum phase the trainee works with real pupils to elicit responses consistent with real objectives. This 'student teaching' is carried out in school settings over an indeterminate period of time and under the supervision of professional teachers. *On entry into the practicum a trainee is assumed to be competent at criterion levels in each separate element of the teaching process.* This was demonstrated in the laboratory phase. In the practicum phase, then, the trainee must synthesize that which he learned and demonstrated in the laboratory. The trainee's performance of the complete teaching act and his skill in explaining why his performance is consistent with a rationale of

teaching is consequently considered evidence of his ability to synthesize the proper elements. He must also be able to justify his choice of objectives in regard to content, specific learner outcomes, and the characteristics of the particular learners with whom he is working.

While in the practicum, the trainee is expected for the first time to demonstrate certain behaviours which reveal his ability to work in an actual school setting. These behaviours have to do with his ability to work with other adults, including his colleagues, in addition to being able to work with elementary pupils. This is the professionalization process which equips the trainee to carry out his role as a member of the teaching profession.

The unique characteristic of the practicum phase is that it has no limited time span.[1] Rather it has extreme flexibility for movement through its different stages, with the trainee increasing his level of competency progressively. These stages are marked by an increasing amount of responsibility being assumed by the trainee as he directs live teaching-learning situations with pupils. The trainee demonstrates his readiness to move from one stage to another by his increased ability to appraise his own performance and to determine the strategies suitable for his own continuing education. Naturally, he is also judged on his ability to increase the appropriateness of pupil responses.

This ability can only be developed through an increase in knowledge in each of the foundation areas described earlier. A logical method for accomplishing this would be to continue formal study in the fields related to the foundation areas. The practicum phase provides for this.

The basic technique for continuing the foundation education of the trainee is via a system of appraisal/self-appraisal, involving a joint enquiry process by the trainee and his supervisors. The supervisor and trainee assess performances together and plan ways of adjusting to their findings. The appraisal instrument will be based upon the behavioural objectives defined in the instructional systems of the laboratory phase. In other words, the objectives of the instructional systems in the laboratory phase will be re-stated as criteria for judging the performance of the trainee in the practicum.

Once the trainee has completed the practicum he is considered a completely competent and professional teacher. Thus far the practicum phase has been discussed rather generally to show its basic function and purpose. In greater detail the procedures for implementing this phase are as follows.

1. The practicum is designed to accommodate the *typical* instructional manager for a period of one to three years, depending on the educational system existing in each country.

Developmental systems

The practicum phase should provide for the design of systems which develop the trainee's abilities. These systems should:

1. Increase the amount of time and responsibility on the part of the trainee for the analysis and direction of his own teaching with actual pupils.
2. Decrease the trainee's dependence upon observation of models and conferences with other trainees for assessment purposes.
3. Provide an interview upon entry into the practicum to determine the trainee's abilities as a prospective instructional manager and an interview after the practicum to determine whether the trainee possesses professional teaching competencies; and if he has attained the desired level of competence, the trainee should be awarded his teaching certificate.
4. Define that evidence of increased ability to judge pupil behaviour in a content field or fields.
5. Define that evidence of increased ability to analyze learning outcomes and learner characteristics.
6. Define that evidence that indicates the trainee has increased his knowledge of himself as a learner.
7. Provide opportunities for the trainee to demonstrate his increased skills and knowledge of essential teaching activities.

Assessment systems

The practicum phase should provide for the design of systems which *continuously* assess the performance of the trainee in the practicum. These systems should:

1. Record the entry behaviour for each trainee.
2. Provide an evaluation instrument to enable the trainee to appraise his behaviour in the laboratory (this appraisal is then used to determine criterion behaviour in the different stages of the practicum).

The assessment systems should also be designed so that the trainee demonstrates his adaptive capability, *based upon his perception of his own performance;* threfore, these systems should provide:

1. Recordings by transcripts, tapes, etc., to facilitate evaluation.
2. Opportunities for the trainee to study several models, e.g., teachers, mediated models, texts, or specific behavioural models defined in evaluation procedures.
3. Regular evaluation of the trainee's performance by the trainee and a staff member.
4. Opportunities for the trainee to state the reasons for his practical teaching decisions and to offer alternatives.

5. Regular consultation with a staff member concerning the trainee's analysis of his performance.
6. Opportunities for the trainee to define his plan for using the evaluations of his initial performance.
7. A method of monitoring the trainee's level of competence with regard to each criterion, e.g., a check-list to be marked by a staff member.
8. Opportunities for the trainee to explain his perception of style by identifying elements of style in his own performance and contrasting them with models of similar performance.

Finally, the assessment systems should provide the means of evaluating a trainee's *commitment to career goals.* Characteristics of these systems, therefore, should be that:

1. The trainee must give his commitment by choosing appropriate levels and domains of behavioural objectives even when his choice may impose great expenditures of time and effort and consequently an increased possibility of failure.
2. The trainee must define and/or explain appropriate objectives by comparing them to other alternatives.
3. The trainee must demonstrate a commitment to the appropriate means of implementing objectives.
4. The systems must provide for means of recording the commitments of trainees.

Criterion considerations

The practicum phase should be designed so that the trainee may reach his optimum level and obtain an initial teaching certificate. The trainee is graduated from the practicum and the teacher-training programme when he has provided evidence of the following:

1. Significant gains in knowledge of the foundations areas and knowledge of teaching performances.
2. Significant gains in the competencies needed for effective instructional management.
3. Commitment to his choice of appropriate instructional objectives and the means of implementing them.
4. Commitment to analyzing his own performances.
5. Commitment to designing his own programme for the continuation of his education as a career-teacher.

General considerations

As was stated previously, the practicum will vary for different individuals. A hypothetical trainee could continue in the practicum indefinitely, in the sense that he might never demonstrate a sufficient level of competence to be judged worthy of progressing further. The practicum encompasses what is traditionally thought of as student teaching and orientation to teaching, but there are no such distinct periods designated in the practicum. The assumption is that the trainee in the practicum goes through a continuous growth programme. Certain phases may be identified, however, and these may be marked by new kinds of responsibilities to be given to the trainee.

As in most initial teacher-training programmes, it is reasonable to expect that the level of competency demonstrated by the trainee entering the practicum will deteriorate before some improvement is noticeable. The purpose of the practicum is achieved when independent observers, supervisors, and perhaps the trainee himself, agree that there has been significant improvement in nearly all the essential competencies.

The trainee completes the practicum, then, when there is significant growth observed in his competencies. A further basis for judgement is the trainee's demonstration of competence in the roles of the professional educator and member of the community. Finally, the trainee must also have manifested increased ability to judge the appropriate nature of the learner responses. This requires evidence that he has increased his knowledge in each of the foundations areas described in the model. His commitment to this goal will be demonstrated by his actions. If it can be shown that the trainee has chosen the more difficult route of affective and complex behaviour when planning objectives, then it may be assumed that he has demonstrated commitment to at least this particular goal. Commitment on the part of the trainee is also demonstrated by his decision to assess his own performances and to design his own improvement programme.

The completion of the practicum is, by its very nature, a decision of several people, including the instructional manager himself, concerning the significant qualitative improvement in his performance and decision-making powers.

Chapter Five

Procedures for the development of non-instructional abilities

In addition to his instructional role and his responsibility for the well-being of elementary pupils (Role 1), the instructional manager has other roles which are non-instructional (Role 2). One is as a facilitator of the instructional procedures, which he carries out by performing routine administrative duties required by the school as an institution. Another includes being able to have discussions with pupils and parents and to co-operate with other professionals in the school. Also, the instructional manager of the future will play the role of facilitator of his own development and professional well-being. More than ever before, the teaching profession will demand constant professional growth in its members. The planners of a teacher-training programme, therefore, must systematically strive to realize this function and to make the programme maximally responsive.

The non-instructional roles of the instructional manager include, but are not limited to, the following:

1. Participation in administrative decision-making regarding policy, curriculum and school management.
2. Work with communities to satisfy the needs of the total school programme, including physical facilities, financial support, respect of patrons, etc.
3. Assistance in the professional growth of fellow-teachers.
4. Personal responsibility for one's own professional growth.
5. Participation in other administrative activities.
6. Improving pre- and in-service teacher-training programmes.
7. Communicating the needs of the profession to the public and the authorities.

The model programme should provide instruction in all tasks for Role 2 competencies for trainees at all levels of development. Systems of the programme should be concerned with the demonstration of (1) general knowledge; (2) knowledge of the elements of the task; (3) abilities to perform the total task.

Systems are designed to accomplish the instruction involved by presenting additional tasks for Role 2.

The specifications for the development of the non-instructional competencies are similar to those required for developing the instructional competencies. The same requirements for task analysis, instructional systems and their design for laboratory and practicum experience must be met. One notable difference between the training for the instructional competencies and the training for non-instructional competencies, however, is that the major part of the educational programme for Role 2 competencies must take place while the trainee is practising in the field. General procedures for the development of non-instructional competencies are as follows:

1. The programme should provide for an analysis of the range of teacher behaviours in order to explain the basic knowledge required for Role 2.
2. The programme should provide for tasks to be stated in the form of behavioural objectives.
3. The programme should provide for instructional systems to produce the behaviours identified in each task.
4. The programme should provide for experiences in which the trainee may continue his training for Role 2 competencies and acquire additional competencies necessary for a teaching career.

In addition to the competencies related to the above-stated tasks, there are certain facilitating competencies which enable the instructional manager to perform his instructional and non-instructional roles in a more effective manner. These are the *general adaptive competencies* and the *inter-personal competencies.*

The performance of Role 1 tasks is largely dependent upon the general adaptive capabilities of an instructional manager. Development of the adaptive capabilities is essential for an instructional manager to carry out the functions of (a) diagnosing or assessing a situation; (b) prescribing predictable alternatives; and (c) implementing procedures. The rationale for developing the general adaptive capabilities is seen largely in terms of that for inter-personal or inter-personal/personal adaptive competencies.

The rationale for the development of inter-personal competencies in the model is derived from research and development both inside and outside the educational field.[1] Essentially the rationale is that the inter-personal competencies needed by social workers, personnel managers, leaders of business and industry, bankers and leading voluntary organizations are identical with those required for trainees, teachers and supervisor teachers.

Several questions should also be asked pertaining to the importance attached

1. The National Training Laboratories Institute for Applied Behavioral Science (NTL-LABS) has been responsible for the most extensive and most sophisticated work in this area.

to human relations in school and in teacher-training programmes which prepare teachers to run a school. What would it be like if a school were to be seen as a laboratory for living and learning in which use was made of the best that is known about human inter-action? How would it be organized? What would be its qualities? Could human relationships themselves constitute a focus for enquiry? In what ways would it be different from the schools we now work in? To answer these questions, ten assumptions may be made which present a logical rationale for giving careful attention to the development of inter-personal/adaptive competencies in the model. These are that:

1. Much of the growing alienation of children and young pupils from learning stems from pressures to engage in cognitive learning activities for which there is little affective commitment or sense of relevance.
2. The motivation to learn is derived from the challenge of meaningful problem-solving or enquiry activities which combine elements of intellectual research, affective involvement and commitment, skilled practice and action closure.
3. The major supports for learning come from two sources; i.e., from norms of a peer group (a group of equals in which one has status, acceptance and positive identification) and from a respected adult who is available as a resource and a guide for learning activities.
4. With the rate, expansion and changes in knowledge, the greatest challenge is to help young learners develop the skills of learning, a sense of self-potential to initiate problem-solving efforts, the inter-personal skills needed to collaborate in giving and receiving help in learning, and the ability to evaluate efforts objectively in relation to clearly stated learning goals.
5. As human relations improve, the efficiency of intellectual activities improves simultaneously. This gives rise to increased opportunity and flexibility and is evidenced by (a) more availability and use of personal resources for learning effort; (b) more freedom to use the resources of other; (c) more individualization of learning patterns; (d) more motivation to learn; (e) more trust of students' initiative by teachers, parents and others.
6. The socio-emotional environment of the school, in which the child spends such a large part of his early life, has a major impact on his mental health and development in terms of human relations.
7. The tasks of 'academic learning' and 'human relations learning' are inter-dependent processes. Therefore, mastering the ability to diagnose inter-personal processes in the work situation is an important step towards the achievement of optimal learning conditions.
8. Knowledge of developmental sequences is very important if a school is to provide appropriate opportunities for human relations learning relative to decision-making, maturity, self-education, initiative, impulse-balance, etc.

9. Creative and productive human relations are facilitated and supported by the proper utilization of educational technology resources and educational time and space.
10. Many organizations and groups in the community, in addition to the schools, have educational objectives and programmes, and collaboration with these other educational and socialization influences is crucial if the child's total learning potential and opportunities are to be realized.

Since most children and adults are operating at a very low level of efficiency in terms of their potential, it is essential to give attention to adaptive, inter-personal, inter-group, organizational and community development competencies in a competency-based, field-centred teacher-training programme. A useful model for approaching this problem has been developed by Fred Massarik.[1]

Massarik's inter-personal matrix represents the interplay of social forces which affect the individual. These representative forces are generally equivalent to the social aspects encountered in an individual's life span. This matrix is defined fully by a network of conceptual behaviours and involves relationships which link the individual with other people about him. It provides an appropriate schema for categorizing as well as determining growth in inter-personal abilities. The inter-personal matrix can be used to consider the relationships between the trainee and persons in his immediate family, personal friends, persons in membership groups, personnel in formal occupational organizations and persons in reference positions; in each case they are viewed as individual relationships, group relationships, or systems of relationships. While the matrix is primarily designed for evaluation and research, it provides an excellent means of categorizing the 'key dimensions of inter-personal competence'.

As has been stated, the end result of the teacher-training programme should be the *effective* instructional manager. How effective an instructional manager a trainee will be largely depends upon the proper development of both his instructional and non-instructional abilities. For this reason, these two parallel and interdependent systems have been developed. The next chapter deals with the personalization process which enables the trainee to integrate the various necessary competencies into a unique and personal teaching style, which is the mark of a professional, career-oriented teacher.

1. Fred Massarik, *A Sensitivity Training Impact Model : Exploration in Human Relation Training and Research*, Washington, D.C., National Training Laboratory Institute for Applied Behavioral Science, National Education Association, 1965 (NTL No. 3).

Chapter Six

The personalization of professional abilities

Learning is personalized in so far as it is perceived by the student as having meaning and relevance to himself. The personalization of learning is different from its individualization. Learning is *individualized* when it is appropriate to the readiness or to the information-processing style of a particular learner. Learning is *personalized* when it involves the learner in actively making choices which are based on considerations of the relevance to himself of what is to be learned. The process of personalizing learning recognizes that the learner is the ultimate, appropriate decision-maker, and allows for an infinite variety of human potentials. The process utilizes technology as an aid to rational decision-making, but never allows pre-programmed materials to dictate personally relevant details.

Two reasons can be advanced for emphasizing the personalization process in the model. The first is derived from the work done by mental health workers in schools. Authorities in this field hold the opinion that adaptive capabilities can best be developed when a great deal of consideration is given to the relevance of learning to the self. The second reason is derived from the consideration of the advances which have been made in the efficient acquisition of knowledge by the use of programmed materials, particularly those communicated with the aid of computer technology. As this trend toward using machine technology gains in momentum, it will require teachers to be more highly trained in emphasizing the *human factors* in education—those that cannot be handled by machines.

To many, the application of systems methodology to instruction is antithetical to the personalization process. They assume that a systematic approach to the problem automatically dehumanizes the process by:

1. Teaching reality as though it exists independently of the individual, thereby forcing individual perceptions to comply with external definitions typically derived from authority.

2. Assuming that meaning exists in instructional materials rather than in the mind of the learner.
3. Treating the student as a recipient of knowledge and as being passive rather than active or searching.
4. Decreasing the opportunities for several starts, as opposed to the searching, ambiguity and stress which typify most important 'real-life' decisions.
5. Failing to recognize 'high-level cognition' as the process by which knowledge is initially developed (and instead treating such a process as an intrinsic property of knowledge itself).

Such a dehumanizing situation could, but need not, exist. There is nothing inherent in a systems design approach that implies that instruction must assume such a stand. In fact, in a systems approach, several advantages which facilitate the personalization of learning are:

1. When the goals of instruction are clearly defined, the trainee can more easily monitor his progress toward them.
2. A careful analysis of teaching tasks leads to a statement of desired outcomes which more closely affect the trainee because of the relationships to actual teaching behaviours.
3. A systematic design of instruction should reduce the number of inefficient, ineffective and non-essential teaching-learning situations.
4. Feed-back is typically furnished to the learner as an integral part of the learning process, thereby increasing his capacity to control his own learning experiences.

The model-based teacher-training programme, therefore, should provide for the personalization process by *fostering the trainee's understanding of himself, allowing him to explore the value, meaning or personal relevance of particular competencies and giving him the freedom and encouragement to develop an individualized style of teaching.*

In practice, these provisions should be used in two different ways. First, they should form the basis for a set of instructional systems designed to *initiate* the process of self-understanding, commitment and searching for a teaching style. Second, and more important, they constitute an integral part of every instructional system designed to promote a given professional competency. A student moving through such a system always has the option of discovering the meaning of the competency for himself personally, his commitment to it, and how he can integrate it into an evolving teaching style. Furthermore, each time a competency is assessed, these three factors and the quality of his performance are kept in mind.

Whenever there is reason to believe that the personalization of a competency is not progressing satisfactorily, or is inadequate, the student is routed through a 'corrective decision' loop from which he may, upon further diagnosis, be

routed through a variety of corrective experiences (see Figure 5). These can vary from conferences designed to facilitate a personalization process, or cycling through a sub-system, to recycling through the re-learning and completing it. The essential point is that a mechanism to facilitate the personalization process should always be available and its use should be mandatory.

There are no specific, independent learning experiences within the instructional programme model designed to effect the personalization of professional abilities. Personalization experiences are always a part of an instructional system designed to produce a given competency, and will take whatever form required to permit exploration of personal relevance or meaning within the system (see Figure 13 overleaf). This form always involves contact with another person, however, either another trainee or a member of the staff, and it almost always focuses upon the effective dimension of the learning content. The basic features of the process in a model-based programme should provide:

1. Instructional activities designed to increase the trainee's awareness of his personal qualities and the implications these have for different teaching styles.
2. Procedures which assess both the cognitive outcomes and the accompanying commitment to them.
3. Procedures which assess both trainee performance and the accompanying behaviour and basic personality characteristics of the trainee.
4. Procedures which assess the *reasons* for performance below criterion level and a means for remediation.

The most important factor to be considered in the personalization process is the trainee's own *self-understanding*.

As used in the model, self-understanding has three components: (1) self-definition; (2) self-awareness; and (3) self-direction.

Self-definition

This concept refers to the questions 'Who am I?' and 'What is my basic personal makeup?' To develop self-definition it is hypothesized that at least three factors are necessary: (a) knowledge of one's own basic personal characteristics or tendencies, (b) an opportunity to distinguish on one's own, unhindered, between one's knowledge and one's behaviour, and (c) an opportunity for others to distinguish, unhindered, between this self-definition and actual behaviour. To accomplish this in the programme, each trainee should be provided with:

1. Objective information about the elements of his personality.
2. A series of non-evaluative interviews to discuss the implications of such information on behaviour.

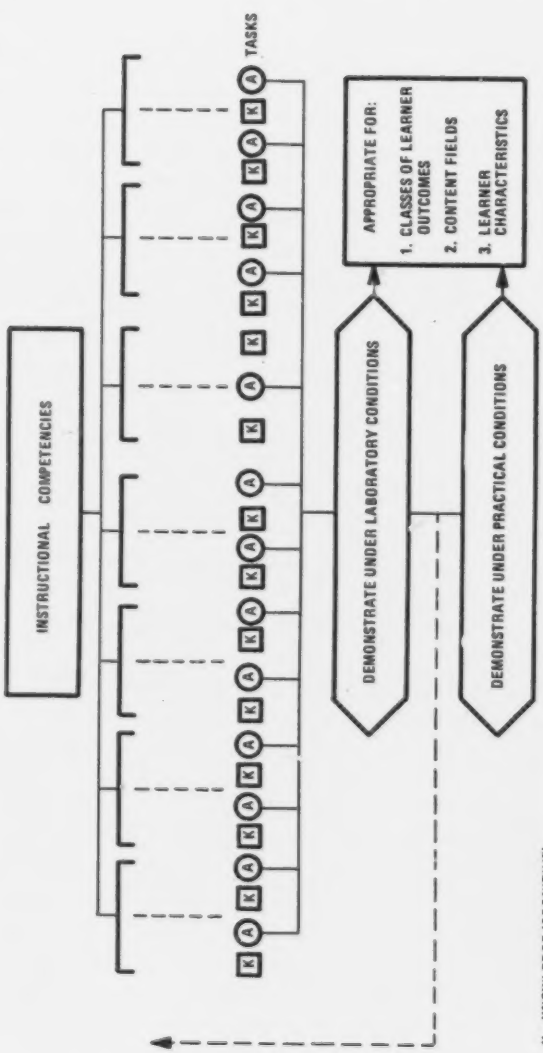

FIGURE 13. *Model for demonstrating instructional competencies*

3. A series of non-evaluative interviews to explore the meaning of behaviour as observed in the laboratory and practicum for self-definition.

Self-awareness

This concept refers to the questions 'What do I do?' and 'How do I do it?', and pertains to the trainee's own learning style. It is hypothesized that at least three factors are necessary for the development of an awareness of learning style: (a) mastery of the concept of learning styles, (b) recognition of alternative styles, and (c) practice in the application of alternative styles. To accomplish this in the programme, each trainee should be provided with:

1. A description of alternative learning styles.
2. Opportunities to describe his own learning style.
3. A series of non-evaluative interviews to explore the meaning of behaviour as observed in the laboratory and practicum for the development of a learning style.
4. Opportunities to demonstrate his ability to identify alternative learning styles in pupils.

Self-direction

This concept refers to the questions 'What do I want?' and 'Where am I going?' This relates to the choice of setting *within which to teach.* It is hypothesized that two factors are necessary to bring this about: (a) knowledge of alternative settings within which to teach and (b) opportunities to practise within these alternative settings. To accomplish this in the programme, each trainee should have opportunities to:

1. Spend time in several classrooms with pupils of differing age levels, ability and socio-economic backgrounds.
2. Specify his preferences as to educational settings by age, ability and socio-economic characteristics.
3. Explain his rationale for such preferences.
4. Have laboratory and practical experience which corresponds to these preferred settings.

Once the trainee begins to answer the questions which define self-understanding, he should also be concerned with clarifying his *commitment* to various competencies needed in the teaching profession.

Commitment

As treated within the model, the concept of commitment refers to the questions 'What do I believe?' and 'What will I accept?' *as this pertains to the development of instructional competencies.* To clarify commitments, it is hypothesized that at least three factors are necessary: (a) knowledge of one's basic attitude, value or belief structure; (b) an opportunity for one to check by oneself, unhindered, the relationship between knowledge and one's behaviour; and (c) an opportunity to have others check, unhindered, the congruence between stated commitment and actual behaviour. To accomplish this in the programme, each trainee should:

1. Be exposed to alternative teaching styles through models.
2. Have opportunities to explain his own teaching style and provide a rationale in support of his preferred teaching style.
3. Have a series of non-evaluative interviews to explore the meaning of behaviour as observed in the laboratory and practicum for the learner's definition of his teaching style.

This concludes the section concerned with the instructional model sub-system. The next section deals with the management model sub-system which is interdependent with the instructional model sub-system. Together these sub-systems make up the complete model system for a teacher-training programme.

Section II

The management model

The management model is the second major sub-system of the teacher-training programme. In this section it will be dealt with in three chapters. The first one states the instructional directives and lays down the initial guidelines for establishing the management model. The remaining chapters are concerned with procedure; Chapter 2 presents the operational guidelines for the model, while Chapter 3 discusses its implementation, beginning with a systematic analysis of instructional management, setting out a hypothetical case of a trainee, and finally considering the roles of the various personnel in the model.

Chapter One

Development of the management model: rationale

'Management' is defined as the organization of human beings upon whom various educational resources are expended, based on the processing of vital information. The purpose of this organization is to accomplish the specified learning outcomes put forth in the instructional systems. Composed of many functions which are interrelated to each other, the management system has three basic 'directives', to enable efficiency of operation.

1. *A management model must exist alongside the instructional model to ensure that, as far as possible, the objectives are being achieved.*

Thus two closely related but independent models have been developed. In any educational programme the need for management is taken for granted; i.e., administrators, counsellors, etc. In a model programme, the same supporting functions must be provided, but because of its individual, personalized and largely self-instructional nature, these functions must exist in a different form. Some of the support functions (to be examined more fully in Chapter 2) are: management of the instructional process *per se,* that is, managing teaching-learning inter-actions; development of instructional systems for use in the programme; continuous evaluation of the effectiveness and appropriateness of the programme as a whole; continuous adaptation of the programme in the light of systematic appraisal; programme execution; personnel selection and training; maintenance of equipment, supplies, and facilities; and maintenance of the information-management system needed to permit all the above to occur. The model demands continuous evaluation and adaptation to achieve instructional objectives as efficiently as possible.

2. *Cost data should be provided for all operations within the model-based teacher-training programme as a whole.*

Two demands are placed upon such a function: the first is that an accounting of the resource requirements—full system costs—be given; the second is that cost statements reflect product costs, effectiveness and impact. This is essential because educators have an obligation to study cost/benefit information and will be required to make informed judgments. It is also essential to managers of the model programme for judging programme operation, priorities, etc.

3. *The management model must be organized in such a way that functions within it will have as their aim the enhancement of instruction.*

To accomplish the enhancement of instruction, there must be an adaptive mechanism allowing for constant modification, assessment and evaluation of the programme in the light of evidence concerning effectiveness and appropriateness. This can be referred to as corrective feed-back. It should be applied to each sub-system of the model as well as to the model as a whole. At least four kinds of feed-back are needed in an instructional system: (a) feed-back concerning appropriate pupil outcomes, selected as guidelines for determining the particular abilities to be developed in the trainee; this answers the question 'Are the ultimate objectives of the programme the correct ones?' (b) feed-back concerning the effectiveness of each trainee's competencies; this answers the questions 'Does he have the necessary abilities to ensure the desired outcomes in pupils?' and 'Are his chosen areas of interest correct for him?' (c) feed-back concerning the effectiveness of instructional systems in achieving the competencies for which they were designed; this answers the question 'Are the methods used in teacher-training effective?' and (d) feed-back on the impact of the model programme beyond its immediate influence on teachers and pupils; this answers the question 'Is the school or large social system changed as a result of the programme?'

Too frequently the founding purpose of many programmes is lost sight of or relegated to a position of secondary importance as time passes and the operational demands take their toll. With so many functional components needed as support, a model-based programme is particularly susceptible to this threat; any of the support components could readily become an agency unto itself. The management model presented in Figure 14 is the result of an effort to create an organization, an operational framework that acts as a protection against this sort of danger. Conceptually this framework (1) places the instructional programme in the centre of the model; (2) stresses the idea that information and directional influence flow both from the instructional component to

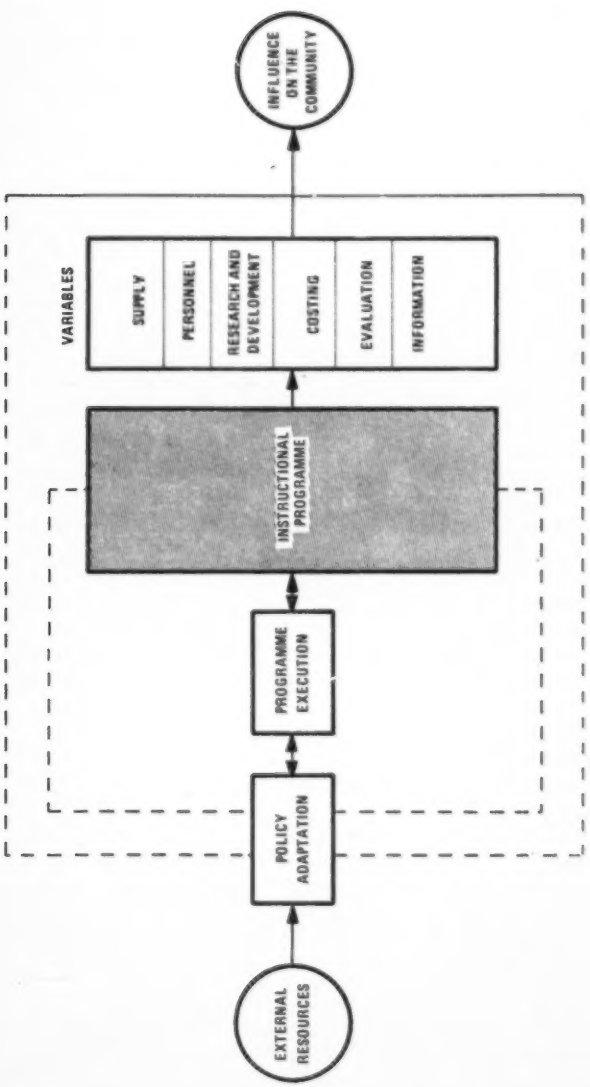

FIGURE 14. *The management system model*

the support units and *vice versa;* and (3) provides for a continuous flow of information to the policy-adapted component and hence to the programme execution component.[1]

While such a model cannot guarantee that all units within a teacher-training programme model will act in concert, it does provide an operational framework which at least makes it possible.

1. It must be pointed out that the labels within the boxes in Figure 14 refer only to the functions that must go on in the management system; they do not refer to who performs these functions or the manner in which they should be carried out. For example, the box labelled 'Policy Adaptation' indicates that the functions of establishing policy, translating policy into operational guidelines, deciding upon new and/or modified programme operations, carrying out inter- and intra-institutional coordination, etc., must be accomplished. The model does not specify the nature of the organizational structure needed to carry out these functions.

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Chapter Two

Operational guidelines for the management model

Unlike the instructional sub-system, the management model has no specific procedures for implementation in a teacher-training programme. Therefore, this chapter deals with the characteristics, various functions, and scope of the management sub-system itself.

Characteristics of the management system

Since the instructional model is the focus of the teacher-training programme, it establishes the frame of reference for the operation of the management system. Thus the first characteristic of the management system is its *dependent* relationship on the instructional programme. The function of the management system is to achieve the goals of the instructional programme. However, the management system as a dependent variable is not passive in nature, i.e., it does not await express directives before calling for action. Rather it is aggressive in actively seeking out the information it needs to serve the instructional programme.

The second characteristic of the management system lies in its *receptive* nature for the direction of the instructional programme. The management system determines what needs are to be provided for by detecting and identifying the instructional programme operations and outcomes in their minutest details. This calls for an information network to ensure that all management components can be appropriately informed of events or conditions influencing their operations or products.

A third characteristic of the management system is its *adaptive-corrective capabilities.* It must be able to evaluate any action that occurs in the model and decide, depending upon the degree of success of that action, upon subsequent alternatives. Figure 5 in Section I illustrates this adaptive-corrective

characteristic with direct reference to the pupil's progress through the instructional system. Figure 15 illustrates this same concept as it is used in the management system. The adaptation-correction function indicates that, following any specific action in the model, evaluation must be made from which a choice of three alternative patterns of responses can be elected. One choice (a) provides a normal forward progression to the next planned action and implies that the initial action results in desired outcomes for which the next planned action is appropriate. A second choice (b) provides access to the next planned action, proceeding to subsequent actions, when the initial action has produced desired outcomes. The next planned action might be inappropriate for these outcomes; another might be more appropriate. It also suggests when additional evaluation is necessary. The third choice (c) implies that the initial action is inadequate to produce the desired outcomes and therefore directs that corrective efforts be taken. Three corrective alternatives are available: (1) modification of previous action; (2) modification of subsequent planned actions; or (3) abandonment of the action chain as ceasing to serve a desired purpose.

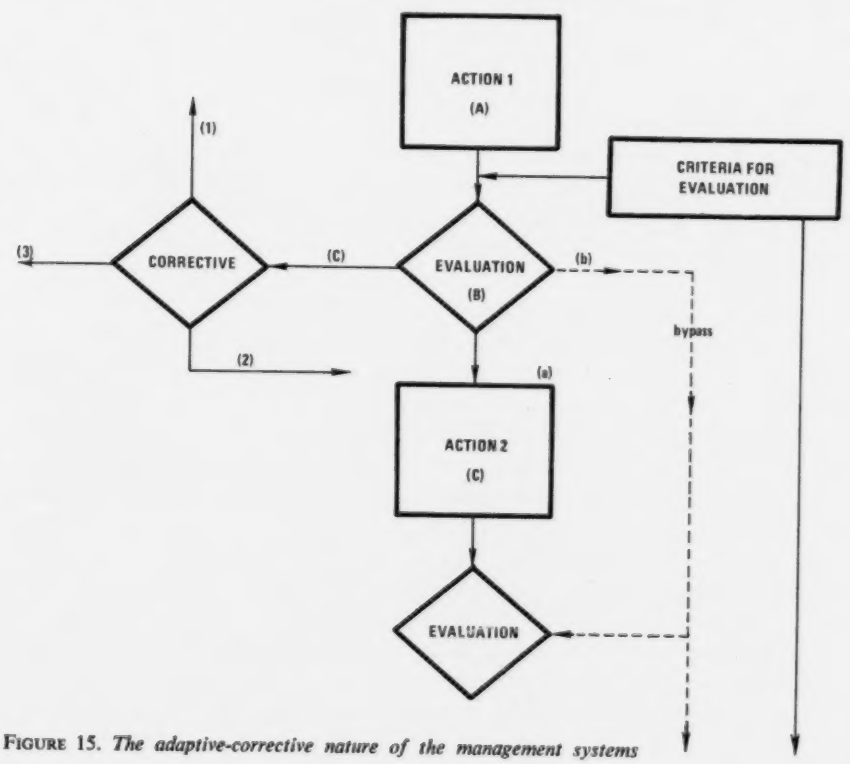

FIGURE 15. *The adaptive-corrective nature of the management systems*

Functions served by the management system

The purpose of the model is to produce teachers who can educate elementary pupils with specified behaviour. This must be accomplished with a maximum degree of effectiveness and the least possible expenditure of resources. It is through the management system that these minimum-maximum limits are achieved. The management system describes functions and allows for the accomplishment of specific goals. A systematic diagram of the relationships between these functions is shown in Figure 14; and each function is described in the following paragraphs.

The decision-making function

Any successful management system must make appropriate and effective decisions. Such decisions in the model are necessary at all functional levels, such as decisions regarding the management of instruction, policy formulation, programme change, the execution of programme operation, etc. In all cases, the decision function is the same: gathering evaluative data about the effects of particular actions in the model, considering these data in terms of the potential resources available, and deciding what corrective or adaptive actions should be taken next.

The process by which decisions are made often reflects the appropriate and effective nature of those decisions. Unless the procedures for making decisions in the model are efficient, achievement of the desired level of effectiveness of instructional managers needed in elementary schools is unlikely. However, the decision-making process cannot remain in the hands of a few individuals if the concepts of the model are to be realized. *Decision-making must pervade the whole model;* it is, therefore, a very important function. A guide for determining the type of personnel to be included in the decision-making process is dependent upon the level of decision in question and who is to be influenced by it.

At least three broad levels of decision-making can be identified as necessary to the model. One level involves policy decisions, since decisions at this level directly influence all functional operations in the model; representatives of all personnel should be included. The impact of such decisions will be felt in the instructional programme; therefore, a sufficient number of representatives from this element of the model is called for. A second level requires the action necessary to reach established goals. This level should be regarded as the operational level and should involve only those functional elements essential to the tasks involved. Decisions at the third level may be described as technical. They are made in terms of relating the operational decisions to the nature of

the resources available. This level of decision should involve special personnel groups as defined by the operations and resources in question.

Policy function

The policy function is the highest-level decision-making process in the model. Professional agencies, i.e., teacher-training institutions, schools, and interested individuals must be represented. Energies are devoted to determining the society's needs in terms of the elementary pupil, and establishing broad operational policies so that the model can satisfy these needs. Therefore, in brief, it should be understood that this function

1. Clarifies and defines the educational goals of society for elementary pupils specially in some developing countries, by obtaining appropriate information from qualified agents, and translates this information into policy statements appropriate for guiding model operations.
2. Provides programme management decisions for programme objectives.

Instructional function

The central box in Figure 14 refers to the instructional programme, which is the focus of the management system. Teaching-learning inter-actions are directed by the instruction function; non-human resources needed to carry out the instructional programme are also organized by the instruction function of the model. Personnel, then, besides being responsible for managing instruction, are involved in various supportive functions. These supportive aspects are not elucidated in the model; however, they are co-ordinated through the programme executive function. Personnel must have a strong voice in policy decisions concerning instructional systems development, programme changes, information flow, quality control, and model-adaptive/corrective functions, especially those pertaining to instruction.

Unless instructional personnel have a voice in shaping and modifying the instruction designed to support its operation, there will be little chance of any high degree of effectiveness. Thus the instruction function

1. Organizes human and non-human resources needed to carry out the instructional programme as specified in Section I.
2. Actively engages in all model policy formulation and translation.
3. Is represented in all model adaptive-corrective functions, with an emphasis on those pertaining to instruction.
4. Determines types and amount of services required for various support functions, and co-ordinates these requirements through the programme execution function.

Programme execution function

The programme execution function is responsible for ensuring that policies are translated into operation guidelines and executed; corrective regulations to be executed are also provided for under this function. This function fosters group involvement rather than individual involvement. A detailed analysis, then, shows that the programme execution function does the following:

1. Establishes and maintains integrated levels of relationships between, and among, the various model functions to permit the execution of necessary adaptive-corrective and support procedures.
2. Translates policies into operational guidelines (support and instructional personnel advise the translators).
3. Evaluates all model operations (support and instructional personnel advise on the evaluations needed, types of data to be collected and the form in which they should be displayed).
4. Establishes means of ensuring appropriate inter- and intra-institutional linkages, and the maintenance of feed-back network necessary to ensure exchange of vital operational data.
5. Designs and implements new or modified programme operations, based on new policy translations from the adaptation function.

Adaptation function

The adaptation function is concerned with the co-ordination, design, modification, and judgement of efficiency of operations necessary for the harmonious operation of the model. This function is responsible for the translation of written policy statements into operational guidelines, and for the recommendation of certain policy decisions based on various data. The instructional and supportive components of the model as well as other resources are needed to carry out these functions. The adaptation function, then, does the following:

1. Translates written policy statements into operational guidelines for the instruction and support components.
2. Judges the operational effectiveness of model; trial data are evaluated in terms of expectations and actual attainments.
3. Recommends policy decisions to the mechanism serving the policy function; decisions are based on: evidence of model operations; data from other model functional elements; data from outside models.
4. Judges the efficiency of a specific functional element, combinations of elements, or the total system on the basis of feed-back from various functional elements.
5. Designs new programme operations on the basis of model policy and analysis

of systems operations; outputs are in the form of new programme specifications.
6. Designs modified programme operations on the basis of model policy statements and/or analysis of operational systems; outputs are in the form of modified programme operations.
7. Issues written directives to specific functional leaders regarding the necessary adaptations on the basis of appraisals of operations and outcomes.
8. Provides feed-back from the total system to ensure effective information flow among the various functional elements.
9. Provides feed-back from other institutions to ensure effective information flow between institutions professionally affiliated with the model.

Information transmission function

This function supplies all information needs for all personnel: trainees, instructional staff, supportive staff and other agencies. Further, it initiates data collection procedures for all model components, maintains centralized information storage, designs data reduction and analysis techniques to support the individual requirements of each model participant, develops methods of synthesizing data, monitors changing information requirements and develops methods to accommodate corrective variations in data collection and retrieval. Since one of the most critical factors in the successful management of the model is the available supply of relevant information, such a system must be able to handle the following:
1. Collect and store information on trainee performance and expectations.
2. Provide the instructional staff with information displays identifying trainee difficulties.
3. Obtain information about trainees and trainee needs to ensure that instructional personnel devote their time to pressing problems.
4. Provide information on scheduled resources on a day-to-day basis for efficient utilization.
5. Store and compile instructional systems data on programme effectiveness, appropriateness, and impact.
6. Combine information on trainee selection and retention characteristics.
7. Compile data about existing and planned resource needs to determine short- and long-range needs.

Probably one reason why the group-centred system has persisted so long in traditional teacher training is that this approach is designed to minimize the information-processing problems of the instructor. Trainees progress towards a common time-goal, are given similar assignments, and take tests at the same time. On the other hand, in individualized instruction, each

trainee may be working at different points in the curriculum, probably requiring different advice, and taking tests at varying times.

Personnel function

The personnel function supplies the staff qualified to meet the demands of the model. It includes recruiting, screening, and selection of trainees for the instructional programme. Selection is dictated by personnel needs of the model, recruitment market, selection criteria, and competencies expected in the operational setting. Furthermore, once the supply of personnel is obtained, the function ensures that the individual needs of all personnel within the model are met. Personnel includes trainees, instructors, and staff.

Supply function

This function serves to supply and/or maintain resources necessary for supporting the model: facilities, equipment, materials. The function is based upon current and projected resources, availability of resources and cost.

Research and development function

The responsibility of this function is designing and developing new instructional systems based upon instructional objectives established in the instruction function. This includes seeking out prospective instructional systems and research developments, preparing specific statements of terminal behaviours, designing specific elements to use in instructional functions, developing prototypes and conducting field tests, and modifying the new instructional systems until they meet standards established by the instructional function. This function also modifies instructional systems on the basis of evaluative data, which evaluates the effectiveness of specific instructional systems, assessing instructional system objectives and trainee performance. Also included in this evaluation is the preparation and validation of evaluation tools, the evaluation itself, and reporting results to appropriate personnel. Research conducted within the model is advised and assisted by this function and, on a limited basis, research on the principles of instruction is carried out.

Cost function

The cost function provides systematic cost accounting data for all operations of the model and makes cost analyses of the cost-effectiveness relationships of various model functions.

The cost function may be best presented as a facilitating mechanism in the decision-making process. As such, it must deal with the major functions of the model as they operate and influence the costing mechanism, the function of management, the allocation and expenditure of resources, and the processing of cost-related information vital to the management operation.

The major features of the model relevant to the cost function include: systems of instruction as the basic unit of the instruction function; instructional system development, which includes design, testing, modification and implementation; all supporting functions to instructions; the organization of the instructional programme and its setting, foundations, laboratory, practicum, and continuing education phases.

To facilitate the management process in the model, there are costing functions to systematically allocate resources to meet programme objectives:

1. A cost-accounting function provides base-line data for all programme operations. This includes the cost associated with individual instructional systems, the total instructional programme costs, and the resource costs for supporting the instructional programme.
2. A cost-effectiveness function provides data for making judgements concerning the cost of alternative instructional systems and their effectiveness in achieving specified programme objectives. The cost-effectiveness judgements include inter-system, intra-system and major programme evaluations.
3. A cost-benefit function assists in making judgements with respect to the costs of the programme and the benefits derived from the programme by both the individual and society. In terms of the model, two principal impact products are definable: instructional managers prepared by the programme, and school pupils instructed through the instructional manager model. The benefits derived from the programme by individuals and society are important types of data to compare against the resources expended in the process of preparing teachers for their role in elementary schools.

Evaluation function

Since the model is designed as an adaptive-corrective programme, it must be responsive both to emerging problems and changing needs. One of the factors critical to the success of such a design is the capability for determination of how effectively its purposes are being achieved. The means for making such judgements depend upon a comprehensive system of evaluation—one that will provide data on the nature of outcomes and on the operations designed to elicit those outcomes. Equally important is the speed by which such evaluations can be provided, i.e., the information must be available at the time that changes are needed, not months or years later.

The evaluation function involves the collection and assessment of data to satisfy questions as to how effective and appropriate the outputs of the model are and what their impact is. It must be determined how well the model accomplishes the purpose for which it was created and whether the objectives of the model are valid, and appropriate. The impact of the outcomes should simulate the effect of the model on its larger environment. Typical examples would be: 'Can those trainees trained in the programme demonstrate the behaviour for which the training was intended?' 'Can teachers still claim to deal effectively with the realities of the environment within which they act?' and 'What are the effects of the model on other teacher-training programmes or on elementary school graduates as they go into high school or the non-academic world?'

The model evaluation system has three major characteristics:

1. The capacity for making observations on the total operations and outcomes of the programme.
2. The capacity for appraising these observations in terms of a given set of standards.
3. The means of providing evaluation outputs.

The terms 'operations' is defined as those actions, transactions or means by which the model functions, and includes all human and non-human resources. Outcomes are defined as the product, artifacts or consequences occurring as the result of operation of the programme.

Observation capabilities. In its widest sense, an observation in the model is defined as the act of describing a given object or event or set of objects or events. Such observations are both static and dynamic in nature. Static observations describe the *relative positions of an operation* with respect to a defined goal and provide the basis for determining the adequacy of this operation. Dynamic observations describe *movement of operations* in terms of defined goals and provide the basis for identification of the causal relationship between an operation or operations and the defined goals. Evaluation questions arising out of operation and outcomes of the model are the precipitators of all observations. To enable the evaluation function to precipitate appropriate observations, two major competencies must be displayed. First, the evaluation question must be analyzed to determine what type of data elicited from which objects and events are relevant to answering the question. Second, the form of the means required to gather the types of data defined above must be identified. In education the former methods of obtaining descriptions of objects or events have been characterized by *obtrusive measures,* which include interviews and teacher-made tests. *Non-obtrusive measures* include documents and products, simple observations and hidden observations. However, observa-

tions must not be regarded as being limited in any way by present major methodologies. The forms by which such observations will be made in the model must be determined by the nature of the object(s) and/or event(s) to be described.

Appraisal capabilities. Once observations and their relevant objects or events have been obtained, these data must then be related to the established standards to determine the degree of variance between observations and standards. The very fact that there must be standards calls for a capacity for reform in the model that has seldom been undertaken in education. Without some formal evaluation basis for comparison, however, the adaptive-corrective capacity of the model can never achieve any power. An example of a model for pre-planning curriculum evaluation is presented by Stake, 1967.[1] Though the model is designed for curriculum, it can be generalized to the evaluation of all other functions of the model.

Evaluation outputs. Each appraisal must be directed toward a certain individual —a consumer—since the only purpose for making an evaluation is to provide information which will enable individuals to make better decisions regarding their subsequent actions. The quality of their continuing actions, however, is dependent upon the nature and form of the evaluation information they receive. The following factors must be considered:

(1) the crucial nature of the data
(2) the accuracy of the data
(3) the sensitivity of the data—indications of their source and references
(4) the time of the data
(5) the manageability of the data
(6) how well the data are expressed to enable them to be converted into decisions.

Unfortunately, the requirements for evaluation output do not remain consistent for all types of consumers. Consumers differ one from another in their evaluation needs, which in turn call for differences in evaluation outputs. For example, a trainee is able to use certain evaluation outputs in a radically different form from that of the instructional systems developer or the policy-maker. The point is that to provide effective outputs, the evaluation function must be concerned as much with who is to receive the data as with what the data needs are.

Evaluation should be considered a spiralling process. A single act of evaluation in the model will never stand as a closed entity. Rather, it will

1. Robert E. Stake, 'The Countenance of Educational Evaluation', in *Teachers College Record*, New York, Columbia University, April 1967.

promote subsequent modification or correction which, in turn, must also be evaluated. This concept is central to the adaptive-corrective nature of the model. Figure 16 depicts this spiral process.

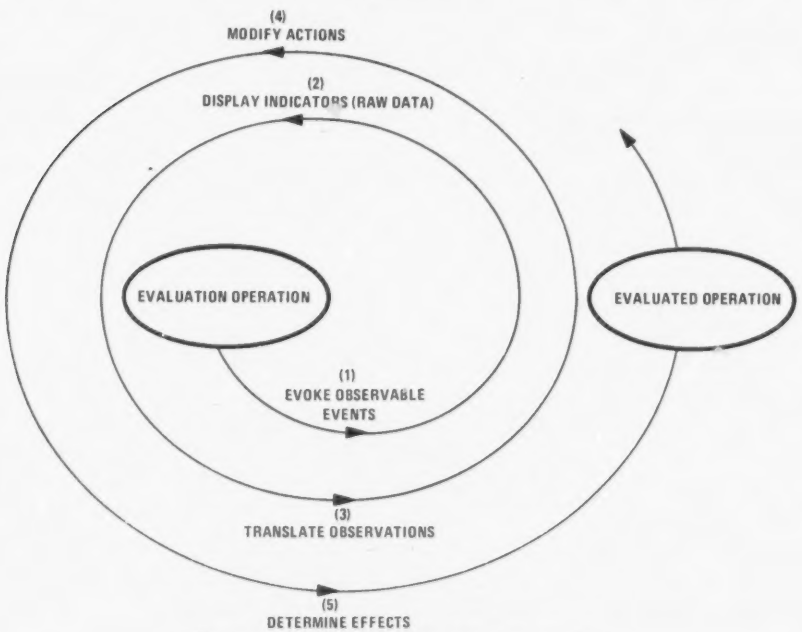

FIGURE 16. *Evaluation as a spiralling process*

The first point in the sequence calls for the evoking of observable events, which then leads to the display of indicators appropriate for eliciting the observable events. Implicit here is the understanding that instructional designs can be determined from evaluation responses already obtained. The next step indicates that data have been collected. This leads to the translation of the data from observations into meaningful outputs for the consumer. On the basis of evaluation, the consumer makes modifications for the operation which leads to a new evaluation cycle of the modified action.

Relationships between functions

Obviously, the eleven functions of the model management system just discussed will not and cannot operate independently. Each must relate to the others in many ways; indeed, the functions are closely interwoven.

The scope of the management system

Thus far very little has been discussed with respect to the limits of the management system. In global terms, the management system includes both the elementary school and the teacher-training institute. The functions set forth in Figure 14 are not reserved for the teacher-training institute only. As the model concept integrally includes both the elementary school and the teacher-training institute, so, too, these institutions are encompassed by the management system.

The implications of this statement are vital to the success of the model. The very fact that elementary-school programmes are a part of the model indicates that they must assume both an operational responsibility and a voice in the direction of the programme. In terms of Figure 14 they must be appropriately represented in all functions of the management system to the extent that such involvement is meaningful to success of the model. No operational specifications are intended by these statements; rather, they are only prepared as broad lines with which to develop the operational design.

The implications for involvement of other outside agencies in the field, such as the Ministry of education, professional and other social institutions is not clear at this time, but must also be studied. It seems obvious that in the years ahead programmes for teacher training must establish systems for carefully monitoring information drawn from such outside agencies. Furthermore, there will probably be a need for various operational relationships with many agencies in the larger environment if, for example, the policy and corrective-adaptive functions of the model are to be properly carried out.

The symbols at the extreme left in Figure 14 indicate that the management system must be sensitive to information from outside the model. This information must be fed into all functional elements of the system. Whether this information is sorted out and dispensed through the routine operation or left to follow directly into a particular function is an operational decision and is of no concern at the moment.

The far right element in Figure 14 focuses on the influence of the model on a larger environment. As such, all functional elements of the model are involved. Obviously, the primary influence comprises the effect instructional managers have upon elementary pupils. However, other influences can be anticipated, such as the design of the model system upon other institutions, or outside agency inter-relationship independent of the model as a result of the model contaminations, etc.

The fact that a model management system is required to manage the instructional programme as it overlaps with the teacher-training programme and public schools, calls for a charter to introduce some form of management

control across all institutions, but only to protect the fundamental interests of each participating institution. Of course, no written agreement establishing a controlling management system could withstand individual institutional considerations, should any of these institutions face internal problems. Every participating institution has direct control over its own operations; any disagreements or new directions are the prime responsibility of the institution itself. Such authority and power, however, cannot be given by any institution to the model management system. Only trust and confidence can establish the authority of the management system so firmly that it never fears the absence of this legal power.

The success of the model management system will undoubtedly rest ultimately upon personalities. Instructors, programme managers, policy-makers, system designers, etc., must develop confidence in the model management concept and in the organization and leadership by which the management system is exercised. No binding agreement can apply to all its parts—only a highly developed sense of mutual confidence can meet the demands of the task.

Chapter Three

Some considerations for the implementation of the management system

This chapter is concerned with three major topics: (1) a systematic analysis of instructional management; (2) a hypothetical case of a trainee in the instructional systems; and (3) the roles of various personnel in the model. These topics have been reserved for the management section because they present additional information necessary for the proper understanding and implementation of the model.

The analysis procedure has been presented to show the conceptual basis upon which the entire model was developed. The hypothetical case summarizes the whole teacher-training programme from the instructional viewpoint and from the management viewpoint as well as from the typical trainee viewpoint. The discussion of personnel is limited, but has been included to raise questions concerning the recruitment and training of qualified staff members for the effective teacher-training programme.

Systematic analysis of instructional management

In this model the ultimate product is the effective instructional manager, i.e., one who elicits appropriate changes in the behaviour of learners. This description of teaching behaviour is perhaps the first step in the first level of analysis; it limits the term, the teacher, to a particular role. Other roles might be those of an instructional analyst or an instructional designer, etc. In general terms the ultimate criterion for effective instructional management is that pupils *do* demonstrate appropriate changes in behaviour.

The discipline of systematic analysis requires that all the components of the object of analysis and the inter-relationships of these components be defined. This requirement dictates that at each level of analysis every meaningful component must be defined and the total of these components must equal the

original product. By constant attempts at identifying the meaningful components, no meaningful parts of the whole will be missed. This identification of meaningful components also guarantees that they will be successfully integrated into the different possible combinations.

The ideal systematic analysis would result in two components for each object of analysis. However, one's perceptions do not always result in two meaningful components each time analysis is made of a given object. The ideal model indicates that judgments may be fallible and further attempts at analysis should be undertaken in the future.

A system should always include some self-correcting facility, and so it is with systems analysis. In the process of systems analysis there is an assessment procedure which treats the following questions each time an object is analyzed: Are these really descriptions of the largest meaningful components, and do these components, taken as a whole, constitute the original? Human analyses are always limited to the information, or input, with which they operate. When the analyst takes an object apart he makes a tentative set of judgments and assumes that these judgments will differ when further information is available and increased capability for conceptualization occurs. The array of components, however, if systematically identified, always shows how a given judgment relates to the whole system.

First level of analysis

The object of analysis, the effective instructional manager, was defined first and then broken into components (see Figure 17). The author gathered information from the available literature on research into teaching and found that there are six components of behaviour when applied to the teaching process which elicit the appropriate behaviour changes in pupils.

In behavioural terms, the effective instructional manager: (1) defines objectives; (2) adjusts objectives for classes of individual differences and individual learner requirements; (3) selects instructional strategies; (4) organizes the learning environment; (5) evaluates changes in behaviour; and (6) decides on the next appropriate instructional step. Ideally, the first level of analysis would have broken the object of analysis into two components. These might have been two components such as: (1) learning to elicit behaviour changes, and (2) executing a plan. The analysis which would have resulted from these two components would be quite different in terms of relationships but would eventually define the same specifics as the six components. However, the six components were seen as the chief meaningful components of this analytical process. The six components might also have been conceived of as two components of another

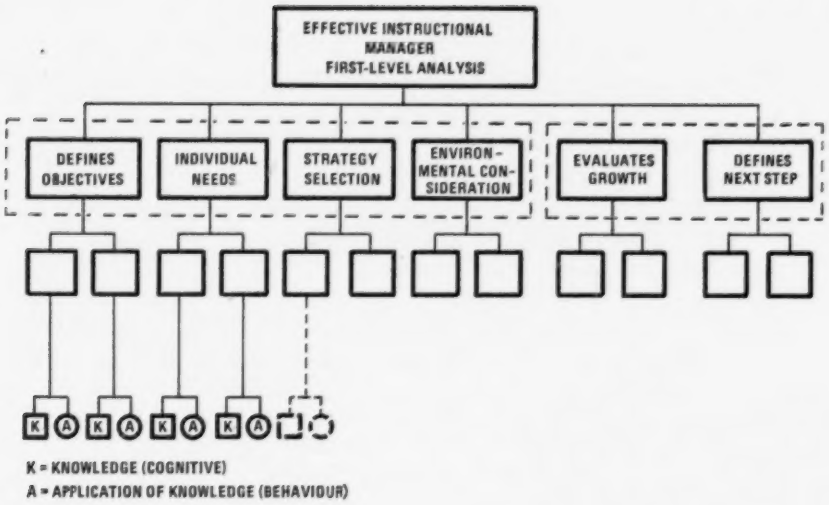

FIGURE 17. *Model for effective instructional manager (first-level analysis)*

form; i.e., a combination component consisting of planning and executing and an evaluative component. The dotted lines in Figure 17 show how these two component alternatives could be derived from the six components listed on the previous page.

Second level of analysis

The second level of analysis breaks down the results of the first level. In the model, two second-level components were identified for each first-level product of analysis. Therefore, the effective instructional manager:

1. Defines objectives:
   (a) states them in operational terms and
   (b) justifies the choice of a particular objective.
2. Adjusts objectives for classes of individual differences and individual learner requirements:
   (a) determines entry behaviour pre-requisites for the objectives and
   (b) devises alternative objectives for different learners according to the pre-requisites they possess for the task.
3. Selects instructional strategies:
   (a) chooses media appropriate to objectives and
   (b) selects learning activities appropriate to objectives.

4. Organizes the learning environment:
   (a) defines sequence of activity and
   (b) manipulates the physical elements of the environment to fit the planned activities.
5. Evaluates changes in behaviour:
   (a) assesses pupil responses and
   (b) provides learners with knowledge of the results of their behaviour.
6. Decides on the next appropriate instructional step:
   (a) recycles so that learners may improve and
   (b) defines next objective.

The complete set of second-order components, when taken as a whole, equals the original object of analysis, the effective instructional manager who elicits appropriate changes in pupil behaviour. Again, it must be stated that this set of components represents judgements which may be revised in light of new information.

Third level of analysis

The process of analysis, of course, may be continued almost indefinitely. In this model, components are broken down until *tasks* are identified individually; finally, the components of these tasks are also identified. The tasks are considered *manageable* parts of the total behaviour of the effective instructional manager.

They are defined as significant blocks of behaviours which, when performed by the student, represent a substantial gain or advance in the body of competencies needed by the effective instructional manager. Together they form the general description of learning systems and each one may be described as a criterion for evaluating teaching.

The tasks in the laboratory have both knowledge and performance components. The knowledge component is necessary to enable a trainee to choose from available alternatives before selecting or carrying out a particular strategy. The trainee must know the characteristics and validity of many teaching techniques in order to choose a particular strategy which he feels to be appropriate for a specific teaching objective. The study and acquisition of this information constitutes a knowledge component of the task 'selecting strategies'. Choosing one or a series of strategies to implement a particular objective would be the performance element of the same task.

In this model, the components of the tasks are the learning activities which the trainee performs in attaining the objectives of the task. Identification of these learning activities is accomplished by the systematic analysis process

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already described. At some point, however, the analyst must decide that a further breakdown of components is not justified in terms of costs and energy. Naturally, though, the further the process is carried, the more specific are the descriptions of the elements of the ultimate product. These descriptions must then be stated as behavioural objectives for the student of teaching and re-stated as criteria for appraising the performance of teachers of instructional managers.

The instructional system — a hypothetical case

The means for enabling students to demonstrate such behaviours in this model is a series of learning systems.

The model for a teacher-training-learning system consists of five elements:

1. A statement and explanation of the desired behaviour.
2. A procedure for assessing each learner's entry level in relation to the desired behaviour.
3. Alternative sequences of learning activities in which each learner either:
   (a) successfully completes behaviours which constitute essential steps leading to the objective; or
   (b) demonstrates an advanced level of entry behaviour, and consequently by-passes selected essential steps leading to the objective; or
   (c) demonstrates a deficiency to meet the essential pre-requisite steps leading to the objectives.
4. A criterion task in which the learner demonstrates the behavioural objectives in terms of a generalized performance standard.
5. A second criterion task in which the learner demonstrates the behavioural objective in terms of performance standards for a *specific situation.*

A hypothetical trainee progresses through the simplest of the inter-actions systems as shown in the following example, designed to clarify the nature of trainee activities envisaged for the laboratory.

The objective in this first inter-action system is to elicit responses indicating that pupils have acquired either some new information or some new performance skills. This is a basic inter-action competency, because all the more complex inter-action performances subsume this particular behaviour. This behaviour is basic *communication*, and is part of the process of inter-action whether the ultimate outcome is derived from the cognitive, affective, or psychomotive domains. The total behaviour expected of the student is defined in the following three steps.

First, he must select some information or some specific skills which he decides will constitute the new behaviour on the part of the pupil.

Second, he must plan activities which lead to the actual demonstration of the desired new behaviour by the pupil.

Third, he must execute his plan with an actual class to obtain real responses and to assess the results of his demonstration.

As the trainee completes each of these three steps he is presented with a series of alternatives, one of which he will concentrate on. Alternatives may be suggested to him by staff members or even by another trainee. Most important, he must receive some kind of feed-back regarding his progress and some suggestion as to the appropriate subsequent step.

The system begins with an explanation of the tasks

In this example, the hypothetical trainee begins by reading an explanation of the task. This consists of two items: (1) a very brief description combined with a chart describing the *communication process* (this is essentially a guide to the teaching strategies which the trainee must design for his task); and (2) a model in the form of a sound tape, a visual tape recording or a film of a teacher successfully demonstrating this behaviour (i.e., *communicating* to pupils and receiving a response indicating that they may have acquired new information). Accompanying this explanation is the assignment to select an appropriate objective and to develop a plan likely to result in the type of response he desires from pupils. This plan is then implemented in an actual classroom setting.

The trainee chooses the next step

When the trainee has accomplished the first step (i.e., to explain the task to the pupils), a number of alternatives are immediately available to him for choosing the next step. He may decide that the explanation is inadequate and that he needs to consult a staff member, or he may decide that, in fact, he understands the explanation but is not sure of the reasons for it. He may not think highly of his own performance of this task and may wonder if this is the appropriate behaviour for inter-acting with pupils. This kind of decision, involving his own attitudes, should result in his moving to a sub-system which provides outside counselling assistance. The sub-system should help the trainee to define and clarify his own values with regard to this particular task. The sub-system is an alternative route for the student at each checkpoint in the system.

Another possibility is that the hypothetical trainee understands the explanation of the task and feels that he knows the problem well enough either to perform the behaviour immediately or to rewrite the complete plan. He then requests an opportunity to demonstrate his new plan with pupils. A staff

member might decide that another alternative would be to by-pass evaluation of the plan and allow the student to try out whatever he had devised with pupils without further feed-back from staff or other trainees.

The trainee selects a behaviour to be acquired by the pupil

For this behaviour, it is most likely that the trainee will move through all the planned steps with frequent opportunities for feed-back, rather than go back or by-pass this sequence of steps. The first step is to select appropriate facts, or a limited performance skill, and to state this information in the form of behavioural objectives. To accomplish this step a trainee must have already acquired the technical competence to describe objectives in behavioural terms and, furthermore, to use these competencies in writing objectives for either cognitive behaviours or psychomotor skills. This he accomplishes by various methods.

The tasks permit demonstration of either psychomotive or cognitive behaviour, since the teaching strategies are nearly identical. As a result of either the cognitive or the psychomotor behaviour, a subsequent and related affective behaviour component will emerge. The laboratory, however, provides the opportunity for concentrating on one aspect of instructional management at a time. Therefore, this task somewhat artificially limits the objective and strategy to either cognitive or psychomotive communication. The emergent affective behaviour tasks add to this basic competency by requiring the hypothetical trainee to obtain from his pupils evidence of affective behaviour combined with cognitive and/or psychomotor behaviours.

The hypothetical trainee then writes a behavioural objective describing a response by a pupil which indicates the acquisition of new information or a new skill. The statement of a behavioural objective is then evaluated by other trainees in the laboratory. On the basis of this judgement a trainee has a variety of alternatives. He may consult the staff to check this judgement, he may go to the counselling sub-system to clarify his own feelings and values as to this behaviour, he may go back and rewrite another objective, or he may proceed to the next step.

Basically, this particular step of selecting appropriate new behaviour for the task is a very simple linear type sub-system. There seem to be no real alternatives for selecting an appropriate 'unit' of behaviour for pupils. The trainee either performs the task and is judged to have performed it satisfactorily, or he does it unsatisfactorily and has to re-do it. This is comparable with what occurs in a linear programme.

A sub-system enables a trainee to write a satisfactory plan

The next step is really a sub-system on planning. The sub-system is based on the assumption that the trainee, having already demonstrated in previous instructional systems that he has acquired the specific behaviour essential to planning, knows how to select media and pupil activities and can organize the learner environment and plan the assessment procedures. Therefore, this sub-system entails two major steps. In step one, the hypothetical trainee writes a plan for an initial strategy for the entire task. This initial strategy has three phases in which the trainee must (1) present new information or skills to the pupil, (2) elicit from the pupil a sufficient number of overt responses in order to assess the effects of the presentation strategy, and (3) design methods of reinforcing the appropriate responses pupils will make.

Step two of the planning sub-system is actually a repeat of step one; that is, the trainee must provide an alternative strategy, or an additional strategy. The sub-system is completed by a strategy which summarizes for the pupils the nature of the responses and which elicits an acknowledgment of the acquired behaviour. This simple task, based upon a communication model, requires several attempts to elicit the appropriate response, since a single attempt would automatically fail.

The trainee selects one of the alternatives after writing the plan

The plan is then evaluated by the staff. A variety of alternatives result from this evaluation. The alternatives are essentially the same as those which were available to the trainee on completion of the first sub-system for selecting the objectives. If the plan appears to require revision, a staff member may insist that the trainee rewrite it. The trainee might have to select a new objective by reviewing the previous systems on planning skills. Or, again, the staff member may require him to branch out to the sub-system on counselling.

The trainee makes a first attempt to demonstrate criterion behaviour

The hypothetical trainee demonstrates the criterion behaviour required in the task. This particular inter-action is designed so that a version of micro-teaching provides the environment for the criterion behaviour. A small group of pupils of the appropriate age and grade level is used for the demonstration. The trainee is given about five minutes in which to carry out the plan. The inter-action is recorded by means of a visual tape recording, audio-tape or transcript and at the conclusion of the trainee's demonstration, staff members and other trainees sit down and review the performance and responses, and thus evaluate his criterion behaviour.

Alternatives following the first attempt at criterion behaviour

A rather elaborate set of alternatives is designed in the instructional systems which follow the evaluation of the first attempt at the criterion behaviour. Alternatives are provided because this task is considered to be a basic inter-action behaviour subsumed in all future inter-action behaviours. It is important for a high level of success to be achieved by the trainee in this introductory inter-action system. Therefore, all the alternatives presented to the trainee at the conclusion of the planning sub-system are again presented at this point. In addition, the hypothetical trainee may have alternatives leading to a second criterion behaviour attempt.

He may, for example, view a visual example of another teacher successfully demonstrating this performance. This would be the second model of the task which he will have seen, because he viewed a model in the explanation of the task at the very outset. In many ways, it is highly desirable throughout this inter-action of systems for trainees to see more than one model. There is always a variety of styles of teaching which may be effective in achieving a given behavioural outcome on the part of pupils.

Having observed the second model, the hypothetical trainee may then go back to his original plan and revise it. He presents the revision to the staff and proceeds to teach or demonstrate the revised plan to other trainees. This teaching would then be evaluated by the trainee and his classmates.

On the basis of this evaluation, the trainee then has those alternatives which are provided throughout this system, i.e., counselling with staff, going back and repeating, going out to the counselling sub-system, or going on to the final performance.

In any case, a trainee attempts a second criterion behaviour demonstration, in which he meets another group of pupils with whom he will carry out his revised plan. This attempt is again visual example, and the staff evaluates whether he has met a criterion level of performance in the task.

An important part of the evaluation of this and all behaviours in the laboratory is that the responses which the trainee elicits from pupils, or plans to elicit from pupils, must be: (a) appropriate for their content quality; (b) appropriate for the learning outcomes desired, and (c) consistent and appropriate for the particular characteristics of the learners for whom the tasks are intended.

The nature of an appropriate environment for the laboratory has been described in considerable detail in order to clarify the variables of an instructional system. The operation of this environment, i.e., the systems, will enable the trainee to move from small informal groups with other trainees, to conferences with staff members, to simulated situations with elementary-age pupils,

to environments where he can study models of teaching behaviour in the form of transcripts, recordings or films.

How staff members function in the model

The proper functioning of the teacher-training programme requires that a very close relationship exist between one or more staff members and each individual trainee in the laboratory. There will probably not be many situations in which an instructor lectures or demonstrates to a large group of trainees. Since explanations and information need to be available at almost any time for almost any number of trainees, this implies that most exposition will be by media rather than by the human teacher. On the other hand, the system requires that frequent evaluation and feed-back be given to the trainee, and this cannot be provided for with media. Staff members, then, must be closely associated with individual trainees in order to assess performances, help the trainee to assess his own performance, and help the trainee to make appropriate choices.

Instead of 'all-purpose instructors', the instructional systems require specialized competencies usually not found in one single instructor. For example, there must be skilled counselling for the sub-systems designed to enable a trainee to define and clarify his own values regarding each task and the total set of tasks. Likewise, there must be personnel skilled in the operation and production of educational media. Moreover, personnel would have to be recruited who are skilled in the design or re-design of instructional systems for the laboratory. The same is true for professional evaluative personnel. It is conceivable that such a variety of competencies may already exist in the staff members of some teacher-training institutions; however, it is more likely that those institutions wanting to implement this model will have to assess the competencies of their staff and devise special training programmes for their staff members so that they may successfully fulfil the requirements implied in these instructional systems.

Afterword

Assuming that some developing countries will want to utilize this model, it is necessary to spell out as clearly as possible some additional factors which should be considered most carefully before making such a decision. Four factors seem most critical: (1) commitment to the development of such a programme; (2) the availability of the kinds of resources needed to implement it; (3) ability to create and live within the new management structures required for its function; and (4) the availability of time for initiation.

Commitment

It is fair to say that a decision on the part of the staff of a teacher-training programme to adopt the model in its entirety would markedly alter their professional lives. Moreover, it would affect the lives of trainees, the lives of others in any existing teacher-training college or school, and the lives of colleagues in the elementary schools. Therefore, it is critical that all persons influenced by the decisions should have a part in making them.

Resources

When first considered, the resources needed to implement the teacher-training model programme seem staggering. For example, instructional staff with new skills need to be taken on; new personnel with new functions need to be recruited; and highly skilled personnel need to be recruited to carry out evaluation and research functions. In terms of the *nature* of the resources that now exist in teacher-training programmes, these demands are great, but in terms of the *increase* of resources in any absolute sense, they may not be as enormous as they first appear. Instruction within the foundations and the laboratory phases of such a programme is designed to free the instructional staff

from their traditional role of information givers, and thus will permit them to direct their energies elsewhere. Following such a course, energies will be directed to new focal points within the curriculum and in particular to the assessment, diagnosis and prescription functions that are so critical to individualized instruction. In practice this means that some of the resources needed to perform the support functions within the model programme can be found within existing teacher-training institutions.

Two other considerations help offset the apparent demand for new resources to operate such a programme: (1) a major responsibility assumed by the use of early childhood and elementary programmes; and (2) once a pool of effective instructional systems has been developed, research and development costs will go down. This is not to deny, however, that heavy investment is needed in research and development activities to launch and maintain the model programme. None the less, it should be realized that when participating school personnel are prepared to assume a functional role in the proposed model there will be many trade-offs that are not apparent on first reading and which will serve to lessen resource needs.

Adaptability

Persons involved in a model-based programme will be required to undertake a variety of roles and relationships and to be responsible for a number of functions, many of which will be relatively new to them. New skills will be demanded of both instructional and support staff; instructional staff will work closely with management, for example, in deciding programme policy and developing instructional systems; management will involve the co-operation of teacher-training institutions, schools, and communities. A charter based on mutual trust and confidence between participating schools and teaching-training programme institutions should be established. Undoubtedly, embarking upon such a scheme might create anxiety and concern.

Time

Considering the commitments and resources needed, the initiation of the teacher-training model programme requires considerably different lead time than does a shift from one curricular emphasis to another within a traditional programme. It takes time, for example, to establish the functional relationship that the model requires beween teacher-training institutions and participating schools. It is a lengthy process to prepare staff to man the programme, to introduce development-test instruction systems, to establish the information management system, etc. It also takes time to arouse support for the programme from other

professional agencies and the public at large. Given this fact, authorities attempting to establish such a programme need to be aware of the probable necessity for maintaining existing programmes while directing the creation of the new one.

From the foregoing it is obvious that adaption of the model will not simplify the lives of those responsible for the preparation of teachers, nor will it simplify the lives of trainees planning to become teachers. Yet with all of its complexities and uncertainties there is a positive attraction to the model. There is a power and an order and a logic that excites. There is a vision of an end that could bring to teacher training the means to achieve its fundamental aims.

Part II

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Implementation of the teacher-training model in developing countries

The preceding analysis of the scope and nature of the project suggests that trainee instructional managers progress from initial stages of establishing a framework on which to build competencies, through a stage of synthesis of this framework in a laboratory, to that of the practicum where one demonstrates the competencies acquired in the laboratory. This same process must hold true for this project. Indeed, a systems analysis of teacher training for developing countries must certainly not exclude the commitment to follow the same general philosophy. To define the scope and nature of a project and build a lattice for its fruition is but a part of the job. Many models might possibly be conceived for this task; their worth depends on the final acid test of implementation, and analysis of results.

This phase is particularly significant in that it incorporates a basic premise of systems analysis—one in which all current systems thinking may have been originated—that of cybernetics. Part II gives an example of guidelines for a feed-back loop which will eventually determine the worth of the hypothesizing that originated the model, and of the specifications for conditions essential to the implementation of the proposed systems model for teacher training in developing countries.

The specifications presented in Part I so far have described the kinds of candidates who are regarded as admittable to the programme; they have provided the criteria for teacher performance expected of trainees at each point along the total programme continuum; and they have presented the guidelines for a longitudinal follow-up evaluation both of teacher performances and of the model teacher-training programme to be adopted by any developing country.

Useful as the above-mentioned specifications are for developing the model programme for the preparation of teachers in a particular country, they would be incomplete for the accomplishment of the tasks without detailed concern

for such matters as instructional programme sequence, methods of content selection and presentation, organization and administration of the programme, utilization of staff and facilities, extensiveness of laboratory facilities, orientation programme, and the in-service training of the institute personnel to carry out the model programme. Some of these were the concerns of the case studies on possible implementation of the model in some selected developing countries; areas of particular concern were curriculum development in elementary education, supportive systems, and evaluation procedures.

The developing countries selected as criteria for the model were Sudan, Kuwait, and Ceylon. Their choice was predicated on their position along a continuum defined as to ease of implementing the system in terms of available resources and facilities while Ceylon was more characteristic of the majority represented the 'tails' of a distribution of developing countries in terms of resources and facilities. The rationale employed was that Kuwait and the Sudan and would give good reference as to the worth of the proposed programme for the bulk of the populace. However, the determinant of the flexibility of the proposed plan lay in its application to the teacher-training systems at the extreme point dimensions, i.e., Sudan and Kuwait; and the case study of Sudan, which has been selected for publication, will enable the reader to judge for himself the extent to which the model can be adapted to the prevailing circumstances.

In order to maintain a proper perspective, we give first an analysis of the socio-economic/educational and training background and the procedure for implementation.

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A case study of Sudan

Introduction

As of 1 September, 1970, Sudan began the implementing of a new reform for its educational systems. Accordingly, the curriculum and texts are being revised to meet the new demands of such a reform.

However, at present Sudan represents one end of the continuum of developing countries in terms of resources and facilities available for its teacher-training institutes, as well as for the education it provides for the general populace. Consequently, the average classroom in the Sudan lacks efficiency and effectiveness because of overcrowded conditions. Curricular concerns for Sudan need better organization to gain efficiency. In addition, the curriculum of elementary education needs to be adapted to conditions as they exist and as they are expected to exist after the introduction of the reform. This case study's ultimate concern is for a practical and realistic consideration of this country's problems.

Sudan has various teacher-training institutes but does not produce enough qualified personnel to counteract the present conditions of an overloaded system. This is coupled with lack of efficient procedures in effecting pupil behaviour change. There is need for a more explicit statement of objectives for each level of instruction as well as for each area of subject-matter in the schools. This would initially dispel the differences which exist between the strategies taught at the teacher-training institutes and what is being presented, in reality, at the elementary school. Self-contained curricula at each level of elementary education to meet the terminal needs of the school populations should be a major effort of the educationalists of this country. Accordingly, emphasis on these ends is proposed for the model of teacher training in Sudan presented in the following pages.

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1. Socio-economic background

Location

Sudan is a mainly plateau country of some 967,500 square miles, located in north-east Africa, and bisected from north to south by the Nile, which provides the lifeline of the country. It is bordered by the United Arab Republic to the north, Libya to the north-west, Chad, the Central African Republic and the Congo to the west and south-west; Uganda and Kenya are due south, and Ethiopia and the Red Sea border Sudan in the east.

Population

The population of Sudan was estimated at 14.355 million in July 1967; this is based on the 1955-56 census and an estimated 2.8 per cent growth rate per year. Only about 10 per cent of all births of the total population are registered, and '15 to 40 per cent could be classified as nomads'.[1] The over-all population density is about 14.5 per square mile, but the population is actually unequally distributed; it is concentrated mostly in the developed areas along the Nile and its tributaries, and in areas where water supply is reasonably adequate.

The people, a mixture of several small groups, are usually classified into two main groups, Northerners and Southerners. The first group, who are in the majority, inhabit the six northern provinces; they are a mixture of Arab and African origins, Moslem, and in general speak Arabic. The second group are mainly of African origins, inhabit the three southern provinces and speak several African dialects. Amongst them are Pagans, Christians, and Moslems.

1. Ministry of Social Affairs, *First Population Census of Sudan, 1955/56;* Kiesel Salzburg, *21 Facts About the Sudan*, 1958.

'Often these two groups are thought of as racially distinct though in fact, . . . genetically the line is blurred'.[1]

While the north is part of the Sahara Desert, in the far south the vegetation is tropical forest. The Nile is of great economic importance; its waters form an integral indispensable part of the irrigated agricultural system. It is also utilized in certain regions for transportation.

Port Sudan, the only modern port, lies on the Red Sea in the north-east of the country. The railway line plays a vital role in linking the production areas to the port and consumption centres.

National economy

In 1966-67, the Gross National Product was estimated at about 1,550 million dollars; the GNP *per capita* was then about $108.

Statistics concerning the Gross National Product are few and not very reliable. The economy of Sudan is based mainly on agriculture, which employed 85.8 per cent of the labour force in 1955-56 (date of the first census) and produced 60.7 per cent of the Gross Domestic Product. The importance of agriculture in the GDP decreased to 34.3 per cent in 1964. There was a remarkable growth of agricultural production in the 1950s but it appears to have declined after 1963-64. Over the last ten years much emphasis has been laid on development of irrigation schemes, and this accounts for the relatively high growth rate of cotton production, which is the chief export. Between 1962 and 1967, cotton represented on average 46 per cent of the total exports. This indicates very clearly, on the one hand, Sudan's dependence on cotton and, on the other hand, the hazards of fluctuations in the world market prices of cotton. (See Table 1.)

TABLE 1. Composition and value of exports, 1962-63 to 1966-67 (in £S million)

	1962-63		1963-64		1964-65		1965-66		1966-67	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
Cotton	45.5	52.0	40.7	49.5	27.7	40.8	33.2	44.7	34.9	46.7
Sesame	4.2	4.8	5.8	7.1	4.8	7.1	5.7	7.7	6.6	8.8
Groundnuts	6.9	7.8	8.3	10.0	9.8	14.4	7.5	10.1	8.5	11.3
Gum arabic	6.1	7.0	6.5	7.9	7.1	10.5	9.3	12.5	8.4	11.2
Livestock	2.1	2.4	3.3	4.0	3.5	5.2	6.2	8.4	3.4	4.6
Other	22.7	25.9	17.6	21.4	15.0	22.1	12.3	16.6	12.9	17.3
Total	87.5		82.2		67.9		74.2		74.7	

NOTE Percentages may not total 100 because of rounding
SOURCE Ministry of finance figures

1. Richard Grey, *Introduction to Oduho and Deng, The Problem of the Southern Sudan*, London, Institute of Race Relations, 1963, page 1.

Other important export products are groundnuts (11.3 per cent of total exports in 1966-67), gum arabic (11.2 per cent), sesame and livestock. Sudan imports wheat but is self-sufficient in most basic foodstuffs—sorghum, millet, maize.

The share of mining and manufacturing in the total GDP has slightly increased in recent years, from 4.5 per cent in 1955 to 5.7 per cent in 1964, but its economic importance is still very limited, as it is confined to processing agricultural products and production of building materials and consumer goods. As a result of this, Sudan is obliged to import most of its capital goods. (See Table 2.)

TABLE 2. Composition and value of imports, 1962-63 to 1966-67 (in £S million)

	1962-63		1963-64		1964-65		1965-66		1966-67	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
Consumer goods	30.6	34.5	32.3	28.2	23.5	31.7	30.7	38.6	26.1	35.7
Capital goods	27.2	30.7	38.3	33.5	20.8	28.0	20.1	25.3	21.1	28.9
Staple foods	10.2	11.5	21.0	18.4	11.9	16.0	12.4	15.6	10.6	14.5
Other	20.6	23.3	22.8	19.9	18.0	24.3	16.3	20.5	15.3	20.9
Total	88.6		114.4		74.2		79.5		73.1	

NOTE Percentages may not total 100 because of rounding
SOURCE Customs Department

The tertiary sector also plays an important role in Sudan; transport, communications, trade and finance represented 15.6 per cent of the GDP in 1964, while public administration and defence alone represented 18.6 per cent of the GDP.[1]

Generally speaking, the GNP seems to have increased substantially in the early 1960s, due to success in marketing good cotton crops, followed by high investments in the public sector (42.1 million in 1963-64), but after 1965-66 the rate of growth seems to have slowed down. Over the whole period, however, the GNP did not increase much faster than the population, which is estimated to increase at 2.8 per cent per annum.

Public finance

Sources of government revenue (see Table 3.)

Indirect taxes are by far the most important source of government recurrent revenue and their importance increased from 69.4 per cent in 1964-65 to 83.2 per cent in 1966-67. Import duties alone represented 32 per cent of total recurrent revenue in 1966-67. Their importance had decreased between

1. *AID Economic Data Book*, Washington, D.C., section on Sudan, p. 8 (Revision No. 247, September 1970).

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1963-64 and 1966-67, in spite of the increase in the value of imports, as a result of a shift in the structure of imports towards lower-taxed commodities. Revenues from import duties diminished following the reduction of export taxation.

TABLE 3. Central government revenue, 1963-64 to 1966-67 (in £S million)

	1963-64		1964-65		1965-66		1966-67	
	Amount	%	Amount	%	Amount	%	Amount	%
1. Taxes on net income and profits	3.4	4.3	3.8	5.2	4.0	5.3	4.1	5.0
2. Indirect taxes:								
Taxes on production and consumption including sugar monopoly profits	5.3	6.7	16.1	21.8	21.1	28.1	27.5	33.6
Import duties	35.1	44.7	25.9	35.1	27.2	36.2	26.2	32.0
Export duties and royalties	6.5	8.2	5.2	7.1	5.7	7.6	5.2	6.4
Other (including stamp duty, fees and charges)	7.7	9.8	8.9	12.1	6.0	8.0	6.9	8.4
3. Propriety receipts	9.4	12.0	5.0	6.8	1.3	1.7	1.1	1.3
4. Pension contributions	0.5	0.6	0.6	0.8	0.6	0.8	0.8	1.0
5. Other	2.7	3.4	2.1	2.8	2.8	3.7	3.1	3.8
6. Reimbursement and interdepartmental services	8.0	10.2	6.1	8.2	6.4	8.5	6.9	8.4
Total revenue	78.6		73.7		75.1		81.8	

NOTE Percentages may not total 100 because of rounding
SOURCE Ministry of finance and economics

On the other hand, sugar monopoly profits increased sharply between 1963-64 and 1966-67, and so did excise duties and taxes on production and consumption, which now account for 33.1 per cent of total government recurrent revenue.

The public sector dominates the money economy in Sudan, and this explains why the revenue from taxes on net income and profits is low. Stagnation of these revenues is also due to inaccurate assessment and collection, on the one hand, and to the cancellation of certain taxes on the other.

Source of development revenue

The recurrent revenue of the central government has recently been studied; local government, which includes provincial, local and municipal councils, receives grants from the central government in addition to revenue raised from their own taxes. Their capital expenditures, however, are included in the government's development budget. The following is a summary of the situation of the total public capital revenue.

Since 1962-63 central government savings have declined steadily. In fact, expenditures increased regularly from 58.5 million pounds in 1962-63 to 82.4 million pounds in 1966-67, while, on the other hand, total revenues fluctuated but, on the whole, did not increase much.

Local government was also in constant deficit during this period. As a result of this situation, the Sudan government has become more and more reliant upon external loans and grants. Even though capital expenditures decreased, owing partly to financing difficulties and partly to the completion of certain development programmes, the share of external loans and grants in capital financing increased from 37.5 per cent in 1963-64 to 62 per cent in 1966-67.

Deficit financing, on the other hand, fluctuated; in absolute terms it decreased from 21.3 million in 1964-65 to 10.5 million in 1966-67, but its share in total capital revenues remained at the same level as in 1963-64, that is about 45 per cent. (See Table 4.)

TABLE 4. Capital revenues 1963-64 to 1966-67 (in £S million)

	1963-64		1964-65		1965-66		1966-67	
	Amount	%	Amount	%	Amount	%	Amount	%
Government saving	17.8		10.7		2.3		− 0.6	
Local government	− 5.5		− 1.6		− 0.3		− 1.2	
Public entities	+ 2.7		− 5.3		0.0		− 0.8	
Other	− 7.7		− 8.8		− 6.9		+ 0.7	
Over-all deficit financed as follows:								
External loans and grants	13.8	37.5	13.8	45.0	17.5	59.7	14.2	62.0
Deficit financing	19.0	45.1	21.3	69.6	16.4	56.0	10.5	45.9
Government securities	—		0.5		0.3		0.1	
Total	40.1		30.6		29.3		22 9	

SOURCE Ministry of finance and economics and Bank of Sudan

External aid

As stated above, it is evident that Sudan is very much dependent on external loans to finance its capital expenditures. Further, the balance in current account, balance of trade and invisible earnings was in continuous deficit between 1962-63 and 1966-67, creating a more urgent need for external loans.

In 1967, the total external public debt outstanding amounted to $212,806 million,[1] or $290,042 million if undisbursed funds are included. 38.6 per cent of it was owed to international organizations and 56.8 per cent to various national governments. Many loans by the United States government were cancelled after 1967, when diplomatic relations were broken off.

1. Statistical Services Division (Economics Department), Sudan, December 1968.

2. Education and training

The organization and administration of formal education

Structure

The duration of general education in elementary schools is four years, followed by four years of limited entry in the intermediate school, and, finally, by another four years for a smaller entry in the secondary school. Sub-grade and village schools offering two- to three-year courses are being raised to full elementary schools. This pattern, 4+4+4, is followed by private schools that adopt the Sudanese prototype; schools and institutions of the Egyptian Educational Mission, community schools, etc., follow different patterns. As from September 1970, the 4+4+4 pattern will be replaced by a new 6+3+3 pattern.

While the duration of higher education in the University of Khartoum ranges from four years for a general degree in Arts or Sciences to six years for medicine, it is only one to four years in other higher education institutions (see Figure 18).

Co-education has been adopted at the pre-schooling and higher education levels, but it may be found at elementary level in only a few cases. At all levels of general education, boarding facilities are provided for boys and girls from rural areas, where schools do not exist in their own home areas. The University of Khartoum is entirely residential and other higher-education institutions are either residential or bursary-paying.

The school year, July to March, consists of three terms, the total duration of which is 33 teaching weeks. Again, as from 1970 the school year will begin in September and end in May, thus running concurrently with the financial year.

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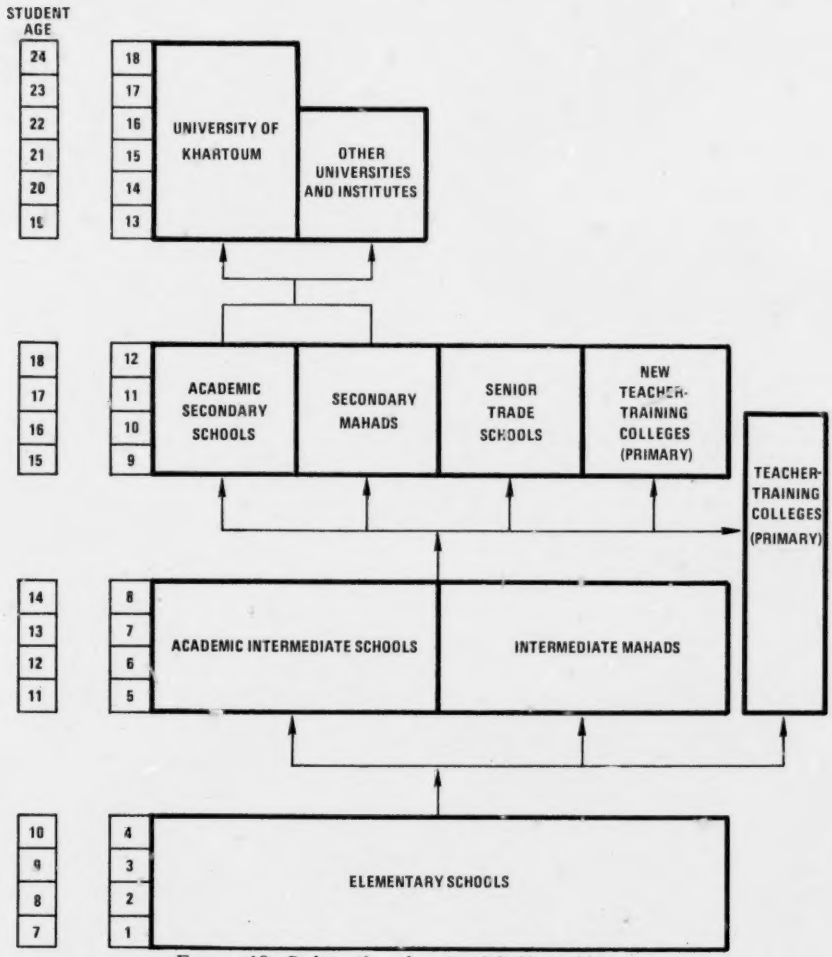

FIGURE 18. *Sudan: the educational ladder, old system*

Categories of schools

There are two main categories of schools, government and non-government. Government schools are of two main types, northern and southern; the main difference between the two was the medium of instruction, Arabic in the north and English in the south, but the teaching of Arabic is being strengthened so that ultimately teachers in the southern provinces may teach in Arabic. Government schools in the north are classified as schools or Mahads; the latter used to emphasize the teaching of Arabic and Islamic religious knowledge, but the

gap between the two is being bridged and may reach the final stages by September 1970.

Non-government schools are of three categories: national voluntary agencies, which follow the national type; Egyptian Educational Mission, which follow the Egyptian system, but are slightly modified to suit Sudan; and Christian missionary societies.

Despite categorization and variations of types it is, in general, possible—subject to fulfilling certain requirements—for a few students at the end of any level (e.g. primary or intermediate) to transfer to another type of category by sitting for the entrance examination of the desired type. Higher-education institutions, on the other hand, are open to a larger proportion of leavers of the various secondary schools who satisfy the minimum university entrance requirements.

Administration

The Ministry of education administers public general education and supervises non-government schools. The latter must comply with regulations governing building standards, maximum fees paid by parents, curriculum, etc.

Higher-education institutions operate either under an independent council set up by a special statute, e.g. University of Khartoum which is guaranteed academic freedom, Khartoum Polytechnic, etc., or under the appropriate ministry or government department. An example of the latter is Shambat Agricultural Institute, which is under the control of the Ministry of agriculture but, like most other higher-education institutions, has a governing board or council which is fairly representative of interested and independent bodies.

Since higher education does not come under the control of one ministry, and since the Ministry of education regulations regarding non-government schools might prove ineffective to deal with all cases, major changes in these fields are made by the government. Two examples may be given: firstly, the missionary schools were taken over by the Ministry of education from missionary societies, and secondly, the Arts and Humanities faculties of the newly-established Islamic University of Omdurman were phased out (because similar faculties already existed in the older University of Khartoum), and thus it was re-oriented to its orginal function—a Higher Institute for Islamic and Arabic Studies.

Central and regional administration (see Figure 19)

The headquarters of the Ministry of education consists of several main sections, each of which is headed by an assistant under-secretary of long service; while

some of them have a post-secondary education or training, others have university qualifications.

The sections dealing with general education are elementary, intermediate, secondary and technical. The other sections deal with adult education, non-government schools, administration, personnel, cultural relations, examinations, education in the southern provinces, and planning. The latter is headed by one of the two deputy under-secretaries, both of whom are responsible to the under-secretary.

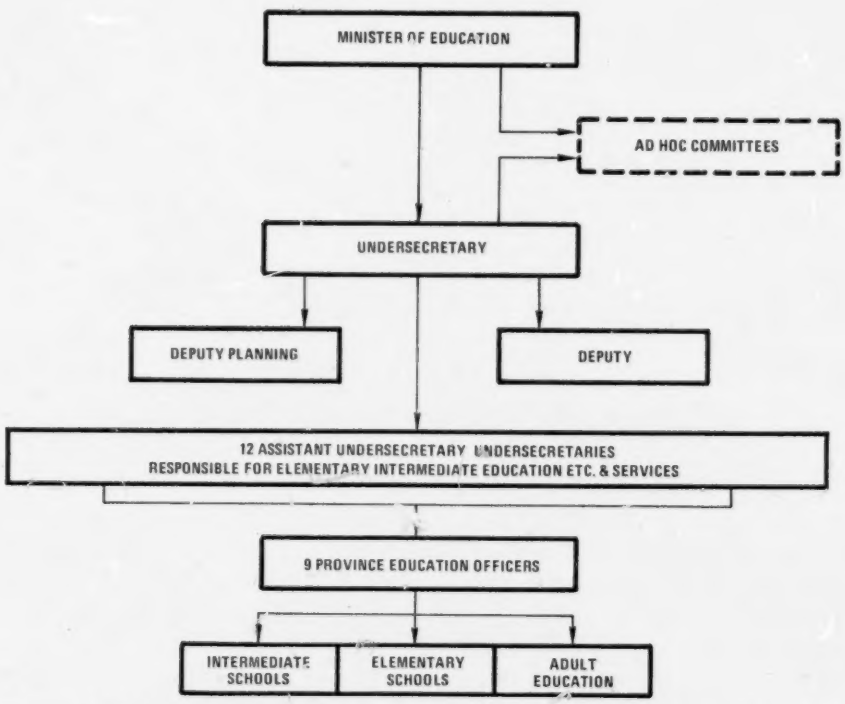

FIGURE 19. *Sudan: administrative structure of the Ministry of education, showing links between central and provincial administration and intermediate and elementary schools*

Teacher training comes under the respective assistant under-secretary in administrative matters only; principals of the two main institutes are of assistant under-secretary status.

In addition to these sections, two departments are affiliated to the Ministry, viz: Departments of antiquities and of religious affairs.

In the headquarters of each of the nine provinces there is an education office responsible for the administrative and professional supervision of elementary

and intermediate education and related activities, e.g. adult education. Consequently, these offices are staffed entirely by elementary and intermediate cadres.

Technical and teacher-training schools and institutions in any province come directly under the supervision of the respective section at the headquarters of the ministry. The types and location of teacher-training schools are shown in Figure 20.

FIGURE 20. *Sudan: location of teacher-training centres*

The six Province education officers for the north are responsible to the assistant under-secretary for intermediate education, but the three for the southern provinces are responsible to the assistant secretary for the southern provinces.

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Elementary education

Structure and objectives

The duration of elementary education is four years. The official entrance age is seven, but those who are eight or over are also admitted, firstly because of lack of adequate facilities and, secondly, because of non-registration of infants at birth.

Promotion from one grade to the next is based upon the pupil's achievement of 50 per cent of the aggregate marks in the final examination at the end of each grade.

The major objectives of elementary education include the three Rs, religious instruction, preparation for intermediate education and rural life.

Student stock and flow

Enrolments are increasing continuously. But since the available facilities do not match the increase, classes are very large and the teacher-pupil ratio is one of the highest in the Arab world. And as a result of phasing out sub-grade schools, sub-grade teachers, who are not fully trained, have been gradually absorbed in the elementary cadre. Graded in-service courses have been set up for them.

The situation in 1967/68 was as follows: out of every 1,000 boys of school age, 402 (40.2 per cent) were admitted to sub-grade and elementary schools. But out of every 1,000 girls only 211 (21.1 per cent) were admitted to school. Consequently, the over-all percentage is 31.2.

Table 5 shows the actual number of schools and pupils for the period 1959-1967, and Tables 6(a) and 6(b) show the promotion rates for elementary and sub-grade schools.

TABLE 5. Enrolment in sub-grade and elementary schools, 1959/60 to 1967/68

	Sub-grade		Elementary	
Year	Schools	Pupils	Schools	Pupils
1959/60	1 296	120 502	904	159 933
1960/61	1 382	135 824	960	171 954
1961/62	1 407	146 909	968	177 969
1962/63	1 390	155 347	1 230	213 542
1963/64	1 442	154 002	1 506	251 256
1964/65	1 347	157 783	1 616	286 013
1965/66	1 010	136 498	1 451	280 510
1966/67	1 030	131 444	1 731	313 558
1967/68	968	117 927	1 857	341 518

TABLE 6 (a). Enrolments and promotion rates, male, 1963/64 to 1967/68

Type of school	Grade	1963/64	1964/65	1965/66	1966/67	1967/68
Sub-grade	1st year	42 954	43 151	26 779	26 906	23 888
	Promotion rate	*94*	*63*	*90*	*77*	
	2nd year	37 685	40 616	27 470	24 240	20 836
	Promotion rate	*61*	*63*	*85*	*86*	
	3rd year	21 312	23 012	25 603	23 582	21 082
	Promotion rate	*27*	*25*	*31*	*33*	
	4th year	5 332	5 884	5 993	8 036	7 818
Elementary	1st year	46 446	53 107	51 205	62 915	69 419
	Promotion rate	*110*	*86*	*103*	*96*	
	2nd year	42 529	51 312	47 841	52 180	60 417
	Promotion rate	*104*	*88*	*107*	*101*	
	3rd year	41 095	44 265	45 385	51 197	52 790
	Promotion rate	*101*	*92*	*106*	*102*	
	4th year	38 174	41 824	40 929	48 501	52 333

TABLE 6 (b). Enrolments and promotion rates, female, 1963/64 to 1967/68

Type of school	Grade	1963/64	1964/65	1965/66	1966/67	1967/68
Sub-grade	1st year	19 228	16 672	16 160	15 672	12 601
	Promotion rate	*73*	*94*	*85*	*83*	
	2nd year	14 970	14 173	15 716	13 802	13 165
	Promotion rate	*67*	*94*	*83*	*90*	
	3rd year	9 315	10 053	13 328	13 118	12 508
	Promotion rate	*45*	*54*	*45*	*45*	
	4th year	3 206	4 222	5 509	6 088	6 029
Elementary	1st year	27 859	29 793	27 515	29 218	31 038
	Promotion rate	*93*	*87*	*89*	*95*	
	2nd year	19 828	26 166	25 158	24 493	28 030
	Promotion rate	*99*	*87*	*89*	*100*	
	3rd year	17 399	19 812	3 021	23 393	24 542
	Promotion rate	*99*	*93*	*94*	*97*	
	4th year	14 926	17 255	18 456	21 661	22 749

Curriculum

The weekly programme consists of 20 to 35 periods, each of a duration of 40 minutes. Variations between girls' and boys' schools, the different grades and subjects, are illustrated by Table 7.

The curriculum for schools all over the country is drawn up by Bakht-er Ruda Institute of Education; *ad hoc* committees are set up from time to time to review one aspect or another.

TABLE 7. Weekly timetable in elementary schools for boys and girls in 1968

	Girls' schools				Boys' schools			
	1st year	2nd year	3rd year	4th year	1st year	2nd year	3rd year	4th year
1. Religious knowledge	4	4	4	4	5	5	4	4
2. Arabic	8	8	8	8	5	8	8	6
3. Arithmetic	6	6	6	6	5	6	6	6
4. Geography	–	–	2	2	–	2	3	1
5. History	–	–	2	2	–	1	1	1
6. Elementary science	–	–	2	2	–	2	3	2
7. Gardening	–	–	–	–	–	–	–	1
8. Arts and handwork	2	3	3	3	3	2	2	2
9. Topics	–	–	–	–	–	–	–	6
10. Physical training	1	1	1	1	2	2	2	2
11. Hygiene	–	–	–	1	–	–	–	–
12. Domestic science	–	2	3	3	–	–	–	–
13. Dressmaking	2	2	3	3	–	–	–	–
Total	23	26	34	35	20	28	29	31

NOTE The curricula for all levels of education were reconsidered in July 1969 and more emphasis was given to mathematics, science, etc. by reducing the number of periods for religious knowledge.

Textbooks, teachers' handbooks, visual aids are written by Bakht-er Ruda. The same textbook for the different subjects is used by all schools throughout the country. There is a serious shortage of textbooks; teaching aids are very limited and not available in many schools.

Teachers (see Table 8)

Elementary-school teachers are trained in Bakht-er Ruda or one of its branches in the different provinces. In 1967/68, there were six colleges for men students and three for women students. Except for Bakht-er Ruda (which has a special school, Mabrouka, which admits those who pass the elementary final examination) all institutes admit those who successfully pass the intermediate final and secondary entrance examination. The former are trained for six years and the latter for two years. In both cases, therefore, the total schooling and training is ten years.

In-service training is the responsibility of Bakht-er Ruda and Omdurman Girls' College. UNICEF contributed considerably to a programme for training unqualified sub-grade teachers.

Schools and equipment

The existing school buildings are, in general, of a good standard and those in rural areas are far better than the average village standard. However, since

TABLE 8. Teaching force, sub-grade and elementary, 1961/62 to 1967/68

	Men			Women			
	Trained	Untrained	Total	Trained	Untrained	Total	TOTAL
A. *Sub grade*							
1961/62	2 588	542	3 130	735	96	831	3 961
1962/63	2 597	378	2 975	715	104	819	3 794
1963/64	2 437	433	2 870	825	86	911	3 781
1964/65	2 494	428	2 922	939	94	1 033	3 955
1965/66	1 664	262	1 926	877	93	970	2 896
1966/67	1 740	271	2 011	922	96	1 018	3 029
1967/68	1 691	256	1 947	873	83	956	2 903
Total	15 211	2 570	17 781	5 886	652	6 538	24 319
Percentage	85.5	14.5		90.0	10.0		
Percentage of grand total, by sex			73.1				26.9
B. *Elementary*							
1961/62	2 708	149	2 875	1 109	36	1 145	4 002
1962/63	3 084	224	3 308	1 238	117	1 355	4 663
1963/64	3 295	391	3 686	1 478	153	1 631	5 317
1964/65	3 918	300	4 218	1 670	178	1 848	6 066
1965/66	3 578	280	3 858	1 690	161	1 851	5 709
1966/67	4 018	328	4 346	1 744	170	1 914	6 260
1967/68	4 204	359	4 563	1 816	177	1 993	6 556
Total	24 805	2 031	26 838	10 745	992	11 737	38 573
Percentage	92.4	7.6		91.5	8.5		
Percentage of grand total, by sex			69.6				30.1

maintenance is not carried out regularly, some of the old buildings are in urgent need of repairs. Facilities such as electricity, water supply, etc., vary from one area to another but, in general, they are the same in the schools as those for the village or town, or sometimes slightly better.

Increased enrolment, without a corresponding increase in buildings, has created a number of problems. The most serious are overcrowded classrooms, insufficient benches, desks, etc. In order to overcome these difficulties, the junior form is given a lighter timetable (20 periods per week) and dismissed earlier in the day so that the more overcrowded senior classes may be divided into two rooms. This is necessary on account of there being the same number of rooms as classes in the elementary schools.

The school building unit of the Ministry of education is responsible for the supervision of the construction of school buildings and collaborates with organizations and units interested in low-cost buildings.

Finance and costs

There is no tax for education; all costs are paid by the government, through the budgets of the Ministries of education and local government.

The Ministry of education pays 40 per cent of expenditure on sub-grade schools and 20 per cent of that for elementary; the balance of 60 or 80 per cent is paid by the Ministry of local government.

Building costs at current prices, for three categories of a one-stream elementary school with three staff houses, were as follows for 1966/67:

	£S
(a) a full-time boarding school	40,000
(b) boarding facilities for 50 per cent of enrolment	30,000
(c) a day school	15,000

An analysis of cost per student for the years 1962/63 to 1967/68 indicates that the cost of a boarding student is double the cost of a day student or sometimes even more.

The share of sub-grade and elementary schools in the recurrent expenditure of the Ministry of education for the years 1962/63 to 1967/68 is 40 to 45 per cent (about 10 per cent for sub-grade and 35 per cent for elementary, but the latter is increasing continuously at the expense of the former). It should be emphasized that these percentages are related to formal and non-formal education and general administration, and do not, therefore, take into consideration expenditure on aspects such as museums, cultural relations, subventions to non-government schools, etc.

Intermediate education

Table 9 shows the flow of pupils and teachers for the five years 1963/64 to 1967/68. While the total number of boys and girls increased from 28,762 in 1963/64 to 38,591 in 1967/68, the opportunity of elementary-school leavers

TABLE 9. Intermediate education: number of schools, students and teacher/student ratio, 1963/64 to 1967/68

Year	Schools	Classes	Students	Teacher/student ratio	
				Boys	Girls
1963/64	194	727	28 762	1 : 40	1 : 39
1964/65	217	792	30 800	1 : 38	1 : 38
1965/66	212	751	30 770	1 : 41	1 : 42
1966/67	226	850	36 355	1 : 43	1 : 42
1967/68	239	884	38 591	1 : 44	1 : 43

to be admitted to secondary schools dropped from 20.9 per cent in 1963/64 to 14.8 per cent in 1967/68. Table 10 shows the promotion rates.

Of the total enrolment, 77 per cent are boys and 23 per cent are girls. The class size increased during these five years by 10 per cent.

TABLE 10. Intermediate education: enrolments and promotion rates, 1963/64 to 1967/68

Sex	Grade	1963/64	1964/65	1965/66	1966/67	1967/68
Male	1st year	6 751	6 834	6 822	7 353	7 821
	Promotion rate	*98*	*89*	*101*	*102*	
	2nd year	5 778	6 663	6 121	6 894	7 513
	Promotion rate	*93*	*85*	*109*	*100*	
	3rd year	5 245	5 391	5 721	6 715	6 953
	Promotion rate	*95*	*89*	*118*	*105*	
	4th year	5 183	5 008	4 842	6 760	7 067
Female	1st year	2 059	2 153	2 170	2 412	2 569
	Promotion rate	*99*	*91*	*102*	*97*	
	2nd year	1 457	2 054	1 972	2 219	2 356
	Promotion rate	*102*	*85*	*118*	*95*	
	3rd year	1 181	1 426	1 759	2 144	2 128
	Promotion rate	*102*	*95*	*105*	*101*	
	4th year	1 108	1 271	1 363	1 858	2 185

The weekly programme for boys' and girls' schools is shown in Table 11. The curriculum is drawn up and revised and textbooks are written by the intermediate teacher-training college, a section of Bakht-er Ruda. It is the only college for training men teachers for intermediate schools. Women teachers are trained at the intermediate teacher-training college at Omdurman, which is gradually taking over the responsibility for curriculum, textbooks, inspection, etc., from Bakht-er Ruda.

TABLE 11. Intermediate schools weekly timetable, 1968

Subject	1st year	2nd year	3rd year	4th year
Religious knowledge	5	5	5	5
Arabic	8	8	8	8
English	9	9	9	9
Geography	4	4	3	3
History	2	2	3	3
Science[1]	4	4	4	4
Mathematics	6	6	6	6
Arts and Crafts	2	2	2	2
Physical Training	2	2	2	2
Total	42	42	42	42

1. Since not all schools were equipped to teach science and as the subject was not examinable for secondary entrance, few schools taught the subject. The periods were allocated to the teaching of other subjects. The timetable is also amended to suit girl's schools teaching domestic science and boy's and girls' schools which are not well equipped.

The main objectives of the curricula are to reinforce the basic skills gained at the elementary school, to prepare pupils for secondary education, and to provide the market with junior clerks, etc.

School buildings are of a better standard than the average building in the town or village, but in some maintenance has been neglected.

It is worth mentioning that non-government intermediate schools in the 1950s exceeded the number of government schools quite considerably. In the 1960s, the majority of schools opted to be taken over by the government.

Secondary education

Table 12 shows the flow of students and teachers for the years 1963/64 to 1967/68. While the actual number of boys and girls admitted to secondary education has risen from 10,892 to 17,385, the percentage of intermediate-school leavers admitted to secondary schools has dropped.

TABLE 12. Secondary education: number of schools, students and teachers, 1963/64 to 1967/68

Year	No. of schools	No. of classrooms	Students	Teachers	Teacher/student ratio
1963/64	94	293	10 892	666	1: 16.35
1964/65	99	341	13 007	792	1: 16.42
1965/66	99	361	13 857	830	1: 16.57
1966/67	105	388	15 664	899	1: 17.42
1967/68	117	412	17 385	1 023	1: 16.99

The class size has been increasing steadily and has now reached 45. Table 13 shows the promotion rates.

The weekly programme is shown in Table 14. The programme for the final form is not strictly followed by all students preparing for entrance to university.

TABLE 13. Secondary education: enrolments and promotion rates, 1963/64 to 1967/68

Sex	Grade	1963/64	1964/65	1965/66	1966/67	1967/68
Male	1st year	3 015	3 160	3 020	3 467	3 738
	Promotion rate	*100*	*96*	*100*	*100*	
	2nd year	2 429	3 016	3 052	3 036	3 477
	Promotion rate	*100*	*94*	*98*	*107*	
	3rd year	1 898	2 429	2 850	3 003	3 264
	Promotion rate	*102*	*88*	*101*	*110*	
	4th year	1 647	1 938	2 161	2 903	3 324
Female	1st year	716	800	792	969	1 036
	Promotion rate	*99*	*97*	*99*	*93*	
	2nd year	523	715	779	790	904
	Promotion rate	*100*	*95*	*101*	*98*	
	3rd year	410	524	681	788	779
	Promotion rate	*103*	*99*	*103*	*109*	
	4th year	259	425	522	708	863

TABLE 14. Secondary schools: weekly timetable, 1968

Subject	1st year	2nd year	3rd year	4th year
English	8	8	8	8
Arabic	6	6	6	6
Religion	3	3	3	3
Science	6	6	6	6
Mathematics	6	6	6	6
Geography	3	3	4	4
History	3	3	4	4
Art	4	4	3	3
Physical education	2	2	1	1
Other	1	1	1	1
Total	42	42	42	42

Science-biased students may drop subjects in order to devote their time to private study.

Instruction in all subjects is now in Arabic, except for schools in the southern provinces and in some private missionary schools in the north.

Secondary-school teachers are trained at the co-educational Higher Teachers Training Institute at Omdurman. Prior to that, Sudanese teachers were trained in the U.K. (and a few in the U.A.R.). Expatriate teachers are few and mainly recruited to teach English, science and mathematics.

Textbooks are written and the curriculum is revised by *ad hoc* committees representative of teachers, the Inspectorate and the H.T.T.I. The national television station is utilized to teach English via that medium. Its use for teaching other subjects is also being considered.

The school-building situation is similar to that of intermediate and elementary schools. There is a shortage of facilities but the problem is not as serious as that of elementary and intermediate schools.

Higher education

Post-secondary education and training was started in the mid-30s by various government departments such as education, agriculture, animal health, etc. These departmental schools were later put under one administration, thus forming the higher schools. In 1947 the higher schools, in a special relationship with the University of London, became the University College of Khartoum and later, by special statute, became the University of Khartoum.

Table 15 shows the flow of students for the years 1963 to 1968. The university has eight faculties which offer undergraduates courses for most subjects. Postgraduate courses are offered by the majority of colleges. 66 per cent of the 681 lecturers, etc., are Sudanese. The majority of the non-Sudanese are British, followed by Egyptians.

TABLE 15. Higher education: number of students by institute and sex, 1963/64 to 1967/68

Year	University of Khartoum			University of Cairo, Khartoum branch			Khartoum Polytechnic			Higher Teacher-training Institute		
	male	female	total	male	female	total	male	female	total	male	female	total
1963/64	1 968	109	2 077	...	...	1 860	733	63	796	50	9	59
1964/65	2 082	154	2 236	...	...	2 234	789	65	854	50	9	59
1965/66	2 380	206	2 586	...	...	2 849	930	67	997	66	14	80
1966/67	2 790	270	3 060	...	...	3 031	847	83	930	...	...	...
1967/68	2 919	323	3 242	4 591	142	4 733	707	74	781	110	10	120

The table also shows the flow of students from the University of Cairo, Khartoum Branch, for the period 1963 to 1968. The courses offered by this university, however, are confined to the arts, law and commerce. It has been announced lately that a scientific faculty would be considered in any future expansion programme of the university.

The Islamic University of Omdurman, whose Act was passed in 1968, was re-oriented in June 1969 to its original role, that of a higher institute for Islamic and Arabic studies, in order to reduce the funds spent on arts and humanities.

The two main non-university higher-education institutions are the Khartoum Polytechnic, and the Higher Teachers Training Institute. The Table shows the flow of students for the period 1963/64 to 1967/68.

In addition to those two institutes there are twenty more institutes which give training in the various fields of higher education; each institution is run by its own council or by the head of the appropriate government department.

Non-formal education

Literacy, adult education, guidance and boys' clubs, are the main aspects of non-formal education organized by the Ministry of education at the national and provincial levels. The Sudan Gezira Board contributes considerably to these activities within the irrigated area of the Gezira Scheme.

Specially trained elementary schoolmasters and mistresses are in charge of these activities. Training at the initial stage is given at Bakht-er Ruda and the community development centre at Shendi. Higher-level training is received by a smaller number at the Fundamental Education Centre in Cairo.

Khartoum Polytechnic organizes evening classes of technical education for workers in the capital. The Ministry of labour runs an apprenticeship programme for the young school leavers.

The Polytechnic also provides academic secondary-level courses in Khartoum and the other main cities. The majority enrolled are secondary-school leavers who have not attained university entrance requirements.

The University of Khartoum's Department of Extra-mural Studies organizes educational and cultural courses of secondary and university levels.

Cultural relations exchange

Sudan signed cultural agreements with a number of Arab and east and west European countries, which facilitate educational and cultural exchanges. As a result, a number of Sudanese students are trained abroad at both the undergraduate and postgraduate levels. English and French teachers are teaching their languages in Sudan and a modest number of foreign students (the majority from African countries) are studying in the different faculties of the University of Khartoum and higher-education institutions. A substantial number of Sudanese teachers from the intermediate and secondary levels are seconded to teach in a number of Arab countries, mainly in Libya, Saudi Arabia, and the People's Democratic Republic of Southern Yemen. Hadramout, a state of the latter Republic, adopted the Sudanese system of education—with slight modifications—and its schools are mainly staffed by Sudanese.

3. Educational expenditures

There are three main sources of educational finance, the Ministry of education, the Ministry of local government (through provinces, local, rural and municipal councils) and voluntary agencies. The expenditure of the Ministry of education is covered entirely from central government, that of the Ministry of local government partly from central government and partly from local government taxes. Elementary and intermediate education is financed 20 per cent by the Ministry of education and 80 per cent by the provincial councils. Sub-grade and village schools, known as council schools, on the other hand, are financed by the Ministry of education and by local councils at the ratio of 40: 60 per cent.

The following tables show actual recurrent expenditures of the central government on education. It is hard to evaluate the real effort of the government in favour of education, as it is not accurately known, firstly, what proportion of the subvention to local councils is actually used for education, secondly, how much is spent by ministries other than education on training and education, and thirdly, how much is contributed by voluntary agencies.

Tables 16, 17 and 18 show actual educational and total expenditures, the education budget as a percentage of the total state expenditure and the GNP, and the total public development expenditures.

TABLE 16. Total public expenditure and educational expenditure (in £S million)

Year	Ministry of Education (a)	Grants to universities (b)	Ministry of local government	Total public expenditure (c)	a+b as percentage of c
1963/64	6.1	—	3.8	60.8	10.0
1964/65	6.5	1.7	9.0	63.0	13.0
1965/66	6.7	2.5	11.7	72.8	12.6
1966/67	5.6	3.4	10.7	82.4	11.0
1967/68	6.4	3.5	11.8	91.9	10.8
1968/69	7.1	4.4	11.9	113.5	10.1

SOURCE Ministry of finance and economics statistics

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TABLE 17. Educational expenditures in £S and as percentages of total state expenditure and GNP

	1963-64	1964-65	1965-66	1966-67	1967-68
Educational expenditures financed by:					
Ministry of education	5 588 332	5 444 296	5 813 965	6 149 013	6 631 499
Provincial councils			4 000 000	7 287 840	13 200 000
Local councils	4 957 140	5 000 000	648 758	642 850	800 000
Total	10 545 472	10 444 296	10 462 723	14 079 703	20 631 499
Educational expenditures as percentage of:					
Total state expenditure	18.1	18.3	14.5	16.9	25.2
Gross national product	2.6	2.6	2.3	3.0	4.2

SOURCE Ministry of education statistics

TABLE 18. Total public development expenditures (in £S million)

	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69
Education	3.6	2.3	1.7	1.9	2.0	2.8
	(8.3 %)	(7.5 %)	(5.8 %)	(8.2 %)	(4.3 %)	(5.6 %)
Total	42.1	30.6	29.3	29.3	46.1	49.7
	(100 %)	(100 %)	(100 %)	(100 %)	(100 %)	(100 %)

4. Methods and curriculum components

Rationale

Methods

The concept of methods and materials in the present model is intended to go somewhat beyond the more traditional teacher preparation programme that Sudan already has, since the graduate of this model programme is being considered not as a technician who merely applies the skills taught to him, but as a practitioner who adapts methods and materials to his teaching style—and to the learning situation. Considering the new reform of the education system in Sudan and its practical implementation in September 1970, the emphasis should be on making techniques and materials available to the trainee, and then placing him in situations where he will have to make decisions as to which methods and materials are the most appropriate to use.

The Sudanese trainee should be exposed to methods and materials early in the programme; however, the heaviest emphasis will be put on them during the senior year. The earliest contact with methods and materials should be designed to acquaint the trainee with available materials, their practical use, and the assessment of pupils' performance. The major purpose of placing this component early in the model programme is to give the trainee specific instructional skills and curriculum-related references for (a) theoretical materials such as human development and social-cultural foundations, and (b) tutoring pupils.

During his pre-professional instruction, the trainee will increase his direct contact with pupils as he progresses from one phase of the model programme to another. Upon entering the senior year of the programme, the trainee will begin to develop ways of dealing effectively with instructional problems of increasing complexity until he becomes an independently competent practitioner.

During his senior year, the trainee will engage in a wide variety of exploratory teaching experiences. Each of these experiences is structured around the concept of team supervision. The senior year will also provide the trainee with experiences and techniques in the area of curriculum decision-making and evaluation.

Competence in subject matters

The problem of helping Sudanese trainees to gain competence in the subject matters of elementary education to meet the new socialistic objectives introduced by the Ministry of education has already been approached in the description of the foundations, laboratory and practicum phases of the model in Part I. It is expected that the successful completion of the trainee's three phases will give him a sufficient foundation upon which to base his understanding of the new primary curriculum content.

Teaching as problem resolution

In this respect, teaching is characterized as a continuing process of problem resolution. The method and curriculum component will be presented to the trainee in this light. The term *resolution* rather than *solution* is used here because it implies a continuing process, whereas *solution* implies a final disposition of the problem. It is felt that in teaching, problems are acted upon in such a way that their nature changes, the change requiring a new course of action.

A problem-resolution pattern for teacher training

Concurrent with the new reform of the educational system in Sudan, it is generally felt that mastering the *process* of acquiring and utilizing knowledge and skill is far more important than the specific knowledge and skills acquired. A person who can apply effective approaches to new situations is better off than one who has been intentionally or inadvertently trained to try to make new situations fit old approaches. This assumption leads to the development of a teacher-training model which emphasizes *the process of learning* rather than its substantive content *per se*.

The process of learning discussed here is synonymous with the problem-resolution approach. According to the present model, this approach is valid for effective learning processes in teacher training; moreover, it provides the opportunity for transfer to new situations.

Problem resolution may be defined as the search for, and implementation

of, a resolution to a practical problem. The problem arises from a conflict between what actually is, and what could or should be. A resolution of the conflict rather than an absolute solution to problems is proposed. This approach concentrates on determining the most effective means of conflict resolution within the problem situation. Effective means are based on evaluation of the resolution in terms of criteria established in the initial approach to the problem situation.

All learning processes involve four steps:

1. Input: the assimilation of information, concepts and principles.
2. Utilization: the selection through synthesis of the input.
3. Output: the application of information structured in the utilization phase.
4. Evaluation of the output in terms of validity, reliability, utility or refined perception.

Problem resolution also involves these same four steps, but the difference lies in where the cycle begins. In problem resolution, the learner begins, not with the input, but with the evaluation which identifies the problem, and then develops criteria to be used later in evaluation of its resolution. Before seeking input, the trainee must face the problem and develop criteria for its resolution. When he enters the input phase of the process, he is already immersed in the learning task; he is seeking input with a well-defined, meaningful purpose.

Specification of each of the above four phases will be discussed later. However, a general acquaintance with the four phases is necessary at this point to emphasize a second crucial aspect of the proposed problem resolution; that is, the feed-back aspect.

Once the trainee has established and gathered input, he may identify a need to re-define the problem or define his criteria; this may, in turn, indicate more input. Eventually, he progresses to the utilizer phase of the programme, in which he tries to structure his information in terms of his criteria. This may send him back for more input, or send him directly (or indirectly through input) to his criteria. The utilizer phase finally leads to output or to a final product which may require direct or indirect return to any or all of the previous steps, but leads ultimately to evaluation in terms of criteria initiated by the definition of the problem, and refined by going through the process of the other phases (Figure 21 presents this concept graphically).

The concept discussed above provides for continual feed-back and refinement as the trainee goes through each step. For example, just as output is viewed as a functional resolution of the problem conflict, input is viewed as a tentative pool of information which may require further development as the trainee goes through the other steps in the process.

The problem-resolution concept requires a flexible teacher-training programme (as mentioned in the proposed system approach model) in order to

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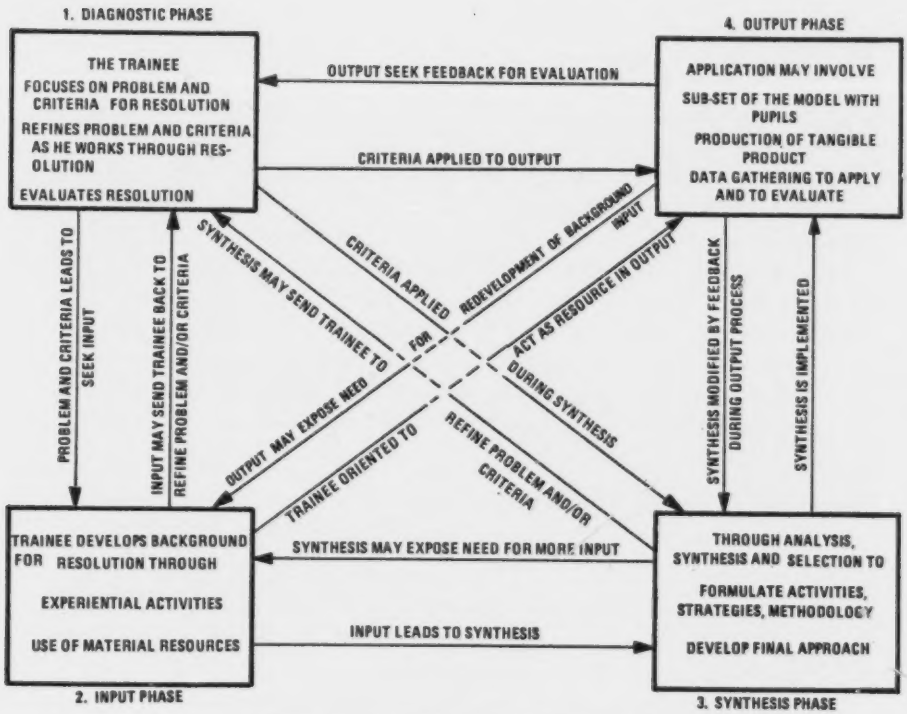
1. DIAGNOSTIC PHASE
THE TRAINEE
FOCUSES ON PROBLEM AND CRITERIA FOR RESOLUTION
REFINES PROBLEM AND CRITERIA AS HE WORKS THROUGH RESOLUTION
EVALUATES RESOLUTION
4. OUTPUT PHASE
APPLICATION MAY INVOLVE
SUB-SET OF THE MODEL WITH PUPILS
PRODUCTION OF TANGIBLE PRODUCT
DATA GATHERING TO APPLY AND TO EVALUATE
OUTPUT SEEK FEEDBACK FOR EVALUATION
CRITERIA APPLIED TO OUTPUT
PROBLEM AND CRITERIA LEADS TO SEEK INPUT
INPUT MAY SEND TRAINEE BACK TO REFINE PROBLEM AND/OR CRITERIA
SYNTHESIS MAY SEND TRAINEE TO
CRITERIA APPLIED
REDEVELOPMENT OF BACKGROUND INPUT
ACT AS RESOURCE IN OUTPUT
DURING SYNTHESIS
OUTPUT MAY EXPOSE NEED
TRAINEE ORIENTED TO
REFINE PROBLEM AND/OR CRITERIA
SYNTHESIS MODIFIED BY FEEDBACK DURING OUTPUT PROCESS
SYNTHESIS IS IMPLEMENTED
TRAINEE DEVELOPS BACKGROUND FOR RESOLUTION THROUGH
EXPERIENTIAL ACTIVITIES
USE OF MATERIAL RESOURCES
SYNTHESIS MAY EXPOSE NEED FOR MORE INPUT
INPUT LEADS TO SYNTHESIS
THROUGH ANALYSIS, SYNTHESIS AND SELECTION TO
FORMULATE ACTIVITIES, STRATEGIES, METHODOLOGY
DEVELOP FINAL APPROACH
2. INPUT PHASE
3. SYNTHESIS PHASE

FIGURE 21. *A model for problem resolution*

produce Sudanese teachers who can become change agents, and who are needed to make the new socialistic reform effective. It offers a unique combination of advantages which can develop commitment to change on the part of teachers. The concept emphasizes *learning*, not *teaching*, but because the input and utilizer phases stress guided learning, the trainee is 'taught' as he will 'teach' trainees who go through the programme, and who will hopefully use the same approach with elementary pupils.

The following are envisioned as strengths of the problem-resolution concept:

1. It starts with broad aspects of evaluation, thus relegating input to a functional-resource position.
2. Feed-back is continuous to the learner, and those involved in resource utilization.
3. It provides opportunity for traditional approaches when (and only when) they are deemed appropriate.
4. It provides opportunity for what is called 'problematical learning task'.
5. It is applicable to any chosen priority of learning tasks.

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6. It provides for individual needs and differences that Sudanese elementary education lacks.
7. It is dynamic in that it incorporates the essence of change.
8. It immerses the trainee in problem-resolution experiences, thus facilitating the transfer of such experiences to pupils at any level.
9. It immerses the trainee in his task and makes input more meaningful and relevant to the Sudanese society.

Problem resolution does not dictate methods of instruction. It forces the trainee to develop instructional techniques which relate to the nature of the problem. It encourages teachers and pupils to view new situations with an open-minded approach, focusing on process and problem resolution as opposed to absolute knowledge and solution. Only under such conditions can a teacher truly become a change agent. What is needed for Sudan is indicated in the Inaugural Session of the National Educational Conference.[1]

Phases of the problem-resolution concept

Phase 1: Diagnosis

In this phase, the trainee traces and defines a problem and develops criteria for its resolution. The criteria are then refined as the trainee works through the other phases of the problem-resolution task.

Problem definition will usually be preceded by a previous stage of unrest, indecision or anxiety, and a trainee may make numerous false starts before he begins to identify the conflict on which the problem is based. Although the learning situation starts with the diagnostic phase, the diagnosis does not proceed in a vacuum; the trainee brings a variety of concepts and skills to bear on the immediate task of identifying the problem. The development of the trainee and of the learning task must be carefully thought out so that the trainee does not reduce his problem to meaningless sophistication. The trainee should apply his knowledge and skill to produce a tentative definition of the problem in the pre-focus stage of unrest.

The diagnostic phase will involve techniques of observation, classification, measurement, analysis, synthesis and an awareness of essential questions and answers related to the problem. It will entail also identification of expected behaviour, present behaviour, inferring, evaluating, ordering, and predicting for establishing criteria for the resolution of the problem. Initially, the criteria may be modified and expanded as the trainee works through the problem-

1. Mohi EL Din Sabir, *Address to the Inaugural Session of the National Education Conference*, Khartoum, Ministry of Education, 1969.

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resolution task. At the point of tentative identification, the trainee has progressed through enough of the diagnostic phase to proceed to the input phase.

Having established criteria for resolution of the problem, the trainee enters the input phase with the idea that he may have to add more criteria, adjust his criteria, or even re-define the problem; he is also immersed in his task and can approach the input stage with purpose and self-imposed direction.

Phase 2: Input (resource assimilation phase)

Having a hypothesis for a problem and criteria for resolution, the trainee approaches this phase in search of feed-back relating to the appropriateness of his perception of the problem and his criteria for its resolution. He will modify his statement and criteria on the basis of this feed-back.

Of most significance, however, is the trainee's search for information and skill development which will enable him to progress to the utilizer phase of the concept. The input phase should specifically develop the trainee's ability to use Sudanese resources in constructing learning experiences and/or teaching techniques related to the problem. In this phase, the trainee should be guided to appropriate materials or experiences by his instructor, or he may involve himself in traditional approaches to learning, such as lectures, discussions, readings and experimental activities. The learning experiences in this phase are not necessarily prescribed, and may come to the trainee as he engages in particular aspects of his problem.

As a result of this phase the trainee should:

1. Develop an awareness of and competence in selection and use of materials to facilitate achievement of the stated objectives of the problem.
2. Develop an understanding of content necessary to comprehend the problem adequately.
3. Continue the formulation of appropriate measurement devices which began with the establishment of criteria in phase 1.

Particular emphasis in this phase is placed on detailed analysis of concepts and skills in terms of normative behaviours at particular ability and maturational levels.

Phase 3: Synthesis (resource utilization phase)

The result of this synthesis should be development of a finalized approach to problem resolution. This might include the preparation of an outline for the development of a lesson-plan or an entire unit, based on the problem statement and criteria established in previous phases of the concept. This approach in particular must be checked against criteria for selection of methods or

activities, both in terms of the problem and the persons involved. Here, the selection of abstractions (theories, principles, ideas, methods) is prepared for application. In a broad sense, the resource-utilization phase represents the final outline of a proposed resolution for the problem immediately before it is implemented.

While it may be assumed that the result of this synthesis would direct the trainee in his teaching behaviour to lead the pupil to phase 1 of a sub-set, it should be noted that circumstances may dictate particular emphasis on a specific phase of the sub-set. For example, if the major procedures had indicated that a group of pupils were particularly weak in a skill area, the input phase of the sub-set might be emphasized in the problem-resolution. However, this input might conceivably be developed as a problem-solving resolution in itself.

Phase 4: Output (competencies phase)

The output phase may be viewed as an application of all the previous phases. The synthesis from phase 3 is applied in instruction or the managerial situation. In this phase, an instructor may evaluate a paper, trainees may discuss and evaluate a report, or data may be recorded by observers through the application of instrumentation to the problem-resolution situation.

The evaluation of output, in terms of the criteria developed in phase 1, may lead to a re-examination of any of the four phases of the concept. For example, if a trainee shows inadequate conceptual understanding of the curriculum content taught to children, he would be directed to the area of resource utilization in phase 2.

If the synthesis results in the application of a problem-resolution approach in dealing with pupils, the output phase would become a sub-set following the procedures of the major concept, with pupils acting out the same four phases that the student has experienced. Such a procedure would direct specific skills, such as pupil-teacher planning, in phase 1. If the 'discovery' approach were to be utilized, the trainee would then become particularly responsible for the development of the resource-utilization phase.

The circular and unified aspect of the concept comes into focus as a result of the output phase. The actual output, being evaluated in terms of the criteria already established, may result in either successful or unsucessful resolution of the problem. These results immediately suggest alternative courses of action. Successful resolution would imply coherence and validity in the procedures followed, and would suggest that the trainee is ready to relate his learnings to other problem-resolution situations, perhaps of a more complex nature. Unsuccessful resolution would indicate a need for the trainee to examine

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his procedures; by doing so, he will be exposed to self-analysis and guided to a remediation.

Application of the concept

As an example of how the problem-resolution concept will look when applied to instructional strategy, the *behavioural statement of objectives* (the first instructional activity) is a pre-test to determine the degree to which the individual needs instruction in writing behavioural objectives into a lesson plan. The pre-test constitutes a source of data for a diagnostic phase of the trainee's problem-resolution cycle. This is concerned with showing the trainee that teaching results in observable behaviour on the part of the pupil.

Thereafter, the trainees (perhaps during a seminar) are given the opportunity to develop their views on the connection between teaching and observable pupil behaviour, and to refine a statement on the problem of learning to state objectives behaviourally. Also during the seminar activities, the trainee is introduced to the materials that he will use in developing the skill of writing behavioural objectives. In addition, he is given problem packages which require the trainee to do such tasks as (1) differentiate between statements of observable and inferential behaviour; (2) translate conceptual objectives into behavioural terms; or (3) rephrase in correct terms poorly stated behavioural objectives. This portion would represent the input phase of the problem-resolution cycle.

Then, the trainees work individually on their problem materials. During this time, they may have access to a staff member who will give them additional data if needed. It is during this period of individual work that all or most of the synthesis and output phases of the problem resolution are accomplished.

The fourth activity consists of another seminar. During this seminar, the trainees and instructors will re-examine the entire rationale behind the use of behavioural objectives, and will explore the difficulties and shortcomings inherent in this approach to teaching. This activity may constitute part of the output phase of problem resolution, in that it may require the trainee to further synthesize his understanding of behavioural objectives. It also constitutes the connective activity between the output and diagnostic phases, in that it leads the trainee to refine criteria for structuring and use of behavioural objectives.

It is possible that some of the trainees will, after refining their criteria for structuring behavioural objectives, see the need for further work on this process. These students may proceed to the fifth activity, which is the remedial activity. In this case, they are returning to the diagnostic phase of the problem-resolution concept.

Of course, as the trainees proceed from one activity to the next, they may engage in the reverse connective processes. For example, while working

individually on his problem package materials, a trainee might see the need for more information and return to the input phase of the cycle by seeking help from the instructor.

In conclusion, the output represents the final product or manifestation or problem resolution which, if successful, indicates to the trainee that he has proceeded through the learning task in a meaningful way, and should provide him with direction as to where he may have failed. Resolution, not solution, is the final outcome of a successful learning task, and the trainee leaves it with the ability to apply similar resolution procedures to new tasks, or with understanding that the resolution, although successful, has enabled him to identify a new and possibly even more important set of problems to be diagnosed and resolved. At the best, problem resolution becomes an on-going series of task engagements and refinements which have the distinct advantage of keeping the trainee and pupil immersed in their learning situations.

The problem resolution model will, therefore, represent the basic methodological approach that will be used in all instructional methods and curriculum components. It will also be the basis for all teaching methods taught to the trainees to facilitate their work with pupils in their careers as teachers.

Curricular areas to be covered

One of the most important aspects of the elementary curriculum and method component is that it will be taught within the content of actual educational problems being faced by teachers and pupils in the primary-school situation. This approach is thought to be important, since the major weakness of the existing teacher-preparation programme in Sudan has been the lack of motivation on the part of the trainees.

The lack of motivation has evidently stemmed from the fact that most of the learning experiences to which the trainees have been exposed, both in the teacher-training institute classrooms and in the primary-school practice situation, have been largely hypothetical or in preparation for the time when the trainee was really going to teach. Even the term 'practicum' (practice teaching) is evidence of this situation. Trainees have learned to make plans for lessons that never were to be taught, make tests of units that never were to be used, grouping arrangements for classes that did not exist, etc. They have been assigned to observe pupils for no identifiable purpose and to teach lessons covering skills and concepts already mastered by the pupils involved. As a result, Sudanese trainees have tended to forget things taught in their training.

If a large number of trainees are to function in a way that will make them useful in working on real educational problems, they must be provided for each working situation with a specific set of skills and related information that

can be applied regardless of the curriculum area in which they will be working. The primary-school curriculum is essentially an integrated one, and the rigid boundaries between its various disciplines, which exist in the old Sudanese primary-school curriculum, are frequently ill-defined at the operational level. For example, a lesson in social studies may involve a good deal of reading; a child with reading problems may be in need of some instruction in speaking and listening, or a lesson in science may very well depend on one or more mathematical concepts.

In order, then, to make the trainee more effective in his practical work with pupils and thus provide them with motivation that might otherwise be lacking, the methods for teaching the four major areas of curricula (language arts and reading, social studies, science, mathematics) should be taught concurrently with each other throughout the programme.

In the following paragraphs, each area will be considered in the light of the above discussion.

Subject Area I: the Arabic language

Sub-area A: Language arts (in eight sections)

1. *Speaking*

a. Classification of pupil-subject related behaviour
   (i) Identify types of formal and informal speaking of pupils
   (ii) Compare speech patterns used in the classroom with those expected at developmental level represented by pupil speaking
   (iii) Identification of pupils who might need help of a speech therapist
b. Behavioural statement of objectives
   (i) Translate concept, principle and affective goals into observable speaking behaviour
c. Construction and use of teacher-made pre- and post-teaching diagnostic devices
   (i) Checklists
   (ii) Conversation and discussion flow-charts
   (iii) Vocabulary identification
   (iv) Structured speech tasks
   (v) Individual progress charts
d. Selection, use and interpretation of tests in listening
e. Selection, construction and use of teaching materials
   (i) Textbooks
   (ii) Written dialogues
   (iii) Informal and formal dramatic selections
   (iv) Articulation exercises and games
   (v) Poems and recitals
   (vi) Pictorial and three-dimensional reaction materials

f. Selection and organization of activities
   (i) Match goals with most appropriate activities
   (ii) Explain to pupils the purpose of the activity
   (iii) Give directions for ordering and carrying out activities
g. Use of planning
   (i) Individual
   (ii) Total group
   (iii) Multi-group

2. *Listening*

a. Classification of pupil-subject related behaviour
   (i) Identify types of listening
   (ii) Compare listening patterns of individual pupils with those expected at development level represented by pupils in question
   (iii) Identify pupils who need to be referred to an audiologist
b. Behavioural statement of objectives
   (i) Translate concept, principle and affective goals into observable listening behaviour
c. Construction and use of teacher-made pre- and post-teaching diagnostic devices
   (i) Checklists
   (ii) Sound identification scales
   (iii) Critical listening tests
d. Selection, use and interpretation of standardized listening achievement tests if available
e. Selection, construction and use of teaching materials
   (i) Sound identification games
   (ii) Recorded listening problems
   (iii) Construction of self-evaluation devices in listening
   (iv) Critical listening problems
   (v) Resource persons and field trips
f. Selection and organization of activities
   (i) Match goals with most appropriate activities
   (ii) Explain to pupils the activity purpose
   (iii) Give directions for organizing and carrying out activities
g. Lesson planning
h. Unit planning
   (i) Single subject listening
   (ii) Integrated with other subject complexes
i. Curriculum planning
   (i) Identifying problems in listening curriculum
   (ii) Clarifying listening objectives
   (iii) Planning curriculum development schedules
   (iv) Interpreting listening curriculum to public
   (v) Evaluating listening curriculum

3. *Usage and grammar*

a. Classification of pupil-subject related behaviour

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(i) Describe linguistically pupil usage and grammar
(ii) Develop criteria for acceptable usage of grammar

b. Behavioural statement of objectives
(i) Translating theoretical description of grammar into functional terms

c. Construction and use of teacher-made pre- and post-teaching diagnostic devices
(i) Oral grammar and usage tests
(ii) Written grammar and usage tests

d. Selection, construction and use of teaching materials
(i) Tape-recorded self-descriptive tasks in grammar and usage
(ii) Written self-descriptive tasks in grammar and usage

e. Selection and organization of activities
(i) Matching goals with activities
(ii) Explaining to pupils the activity purpose
(iii) Giving directions to pupils on organizing and executing activities

f. Lesson planning
(i) Individual and total group
(ii) Multi-group and individualized

g. Unit planning
(i) Single subject
(ii) Integrated with other subject complexes

h. Curriculum planning
(i) Identifying the curricular programme
(ii) Clarifying curriculum objectives
(iii) Planning of curriculum development schedule
(iv) Interpreting curriculum
(v) Evaluating curriculum

4. *Vocabulary*

a. Classification of pupil-subject related behaviour
(i) Describe pupil vocabulary development level
(ii) Relate environment factors and developmental factors to the pupil's vocabulary development

b. Behavioural statement of objectives
(i) Translate stimulus-response, multiple discrimination and concept goals into terms of observable vocabulary behaviour

c. Construction and use of teacher-made pre- and post-teaching diagnostic devices
(i) Definition lists
(ii) Word-matching devices
(iii) Picture identification devices
(iv) Picture-word matching devices
(v) Object-action-quality word matching tasks

d. Selection, use and interpretation of standardized achievement tests

e. Selection, construction and use of teaching materials
(i) Story filmstrips
(ii) Story records
(iii) Literary selections
(iv) Experience stories
(v) Word identification games

(vi) Word building games
f. Selection and organization of activities
(i) Matching goals to most appropriate activities
(ii) Explaining purpose of activities to children
(iii) Giving direction for organization and execution of activity
g. Lesson planning
(i) Individual and total group
(ii) Multi-group and individualized
h. Unit planning
(i) Single subject
(ii) Integrated with other subject complexes
i. Curriculum planning
(i) Identifying vocabulary problems
(ii) Clarifying curriculum objectives
(iii) Planning of curriculum development schedule
(iv) Interpreting curriculum to public

5. *Creative language expression*

a. Classification of creative language behaviour
(i) Identification of creative language behaviour
(ii) Relation of creative language expression with environmental and developmental factors
b. Behaviour statement of objectives
(i) Translate concept, principle and problem-solving objectives into terms of observable behaviour
c. Construction and use of teacher-made pre- and post-teaching diagnostic devices
(i) Identification tests
(ii) Description tests
d. Selection, use and interpretation of standardized achievement tests
e. Selection, construction and use of teaching materials
(i) Reaction records, stories, experiences
(ii) Library selections
(iii) Oral expression tasks
(iv) Written expression tasks
(v) Word invention games
f. Selection and organization of activities
(i) Matching activities to goals
(ii) Explaining purpose of activities to pupils
(iii) Giving directions for organization and execution of activity
(iv) Establishing climate conducive to creative language use
g. Lesson planning
h. Unit planning
(i) Units on creative language
(ii) Integrated with other subject complexes
i. Curriculum planning
(i) Identifying problems in creative language curriculum
(ii) Clarifying objectives of creative language curriculum

(iii) Planning curriculum development schedules
(iv) Interpretation of curriculum to public
(v) Evaluation of curriculum

6. *Spelling*

a. Classification of pupil-subject related behaviour
(i) Description of pupil's spelling characteristics
(ii) Relation of spelling to environmental and developmental factors
b. Behaviour statement of objectives
(i) Translation of stimulus-response, multiple discrimination, concept and principle objectives into terms of spelling behaviour
c. Construction and use of teacher-made pre- and post-teaching diagnostic devices
(i) Word written reproduction tasks
(ii) Non-contextual spelling tests
(iii) Contextual spelling tests
d. Selection, use and interpretation of standardized achievement tests in spelling
e. Selection, construction and use of teaching materials
(i) Phonic element word-building devices
(ii) Word cards and lists
(iii) Spelling games
(iv) Identifications of mis-spelled word tasks
f. Selection and organization of activities
(i) Matching activities to goals
(ii) Explaining purpose of activity to pupil
(iii) Giving directions for organization and execution of activity
g. Lesson planning
(i) Individual and total group
(ii) Multi-group and individualized
h. Unit planning
(i) Spelling units
(ii) Integrated with other subject complexes
i. Curriculum planning
(i) Identifying spelling curriculum problems
(ii) Clarifying curriculum objectives
(iii) Planning curriculum development schedule
(iv) Interpreting curriculum to public
(v) Evaluating curriculum

7. *Handwriting*

a. Classification of pupil-subject related behaviour
(i) Description of pupil's handwriting
(ii) Relation of handwriting to environmental and developmental factors
b. Behaviour statement of objectives
(i) Translate stimulus-response, multiple discriminations and concept objectives into terms of handwriting behaviour
c. Construction and use of teacher-made pre- and post-teaching diagnostic devices
(i) Letter formation, slant and spacing scales

d. Selection, use and interpretation of standardized handwriting scales
e. Selection, construction and use of teaching materials
   (i) Dictation writing tasks
   (ii) Copying tasks
f. Selection and organization of activities
   (i) Matching handwriting goals with activities
   (ii) Explaining purpose of activity to pupil
   (iii) Giving directions for the organization and execution of the activity
g. Lesson planning
   (i) Individual and total group
   (ii) Multi-group and individualized
h. Unit planning
   (i) Handwriting units
   (ii) Integrated with other subject complexes
i. Curriculum planning
   (i) Identifying handwriting curriculum problems
   (ii) Clarifying curriculum objectives in handwriting
   (iii) Planning curriculum development schedule
   (iv) Interpreting the curriculum to the public
   (v) Evaluating handwriting curriculum

8. *Writing (composition)*

a. Classification of pupil-subject related behaviour
   (i) Description of pupil's writing—composition
   (ii) Relation of writing themes to environmental and developmental factors
b. Behaviour statements of objectives
   (i) Translate concept, principle, and problem-solving goals into terms of writing behaviour
c. Construction and use of teacher-made pre- and post-teaching diagnostic devices
   (i) Scales for rating clarity, conciseness, logical progression, mechanics, etc.
d. Selection, construction and use of teaching materials
   (i) Reaction devices to initiate writing themes
   (ii) Literary selection
   (iii) Resource persons and field trips
e. Selection and organization of activities
   (i) Matching goals with the most appropriate activities
   (ii) Explaining to pupils the purpose of the activity
   (iii) Giving directions for the organization and execution of the activity
f. Lesson planning
   (i) Individual and total group
   (ii) Multi-group and individualized
g. Unit planning
   (i) Writing themes and topic units
   (ii) Integrated with other subject complexes
h. Curriculum planning
   (i) Identifying curriculum problems in writing themes
   (ii) Clarifying the curricular objectives of writing themes
   (iii) Planning curriculum development schedule

(iv) Interpreting curriculum to the various publics
(v) Evaluating writing themes curriculum

Sub-area B: reading (in four sections)

1. *Visual-auditory perception and visual motor skills*

a. Classification of pupil-subject related behaviour
  (i) Identification of auditory discrimination level
  (ii) Identification of visual discrimination level
  (iii) Identification of visual-motor skill level
  (iv) Relation of perception and co-ordination skills to environmental and developmental factors
b. Behavioural statements of objectives
  (i) Translation of stimulus-response, multiple discrimination and concept objectives into observable perception and co-ordination behaviours
c. Construction and use of teacher-made pre- and post-teaching diagnostic devices
  (i) Checklists
  (ii) Motor activity scales
  (iii) Visual perception tasks
  (iv) Auditory perception tasks
d. Selection, use and interpretation of standardized achievement tests if available
e. Selection, construction and use of teaching materials
  (i) Rhythmic activities
  (ii) Finger plays
  (iii) Poems and stories for recitation
  (iv) Songs
  (v) Drawing activities
  (vi) Painting activities
  (vii) Construction activities
  (viii) Cutting and pasting activities
  (ix) Formalized worksheet activities
f. Selection and organization of activities
  (i) Matching goals with most appropriate activities
  (ii) Explaining to children the purpose of activity
  (iii) Giving directions for organization and execution of activity
g. Lesson planning
  (i) Individual and total group
  (ii) Multi-group and individualized
h. Unit planning
  (i) Single subject unit
  (ii) Integrated with other subject complexes
i. Curriculum planning
  (i) Identifying curriculum problems in discrimination and co-ordination
  (ii) Clarifying curriculum objectives
  (iii) Planning curriculum development schedule
  (iv) Interpreting curriculum to public
  (v) Evaluating curriculum

2. *Developmental reading*

a. Classification of pupil-subject related behaviour
   (i) Description of reading behaviour
   (ii) Relation of reading behaviour with environmental and developmental factors
b. Behavioural statement of objectives
   (i) Translation of stimulus-response, multiple discrimination, concept and principle objectives into terms of observable reading behaviour
c. Construction of teacher-made pre- and post-teaching diagnostic devices
   (i) Group and individual rate and comprehension inventories
   (ii) Oral reading inventories
   (iii) Vocabulary inventories
d. Selection, use and interpretation of standardized achievement tests, if available
e. Selection, construction and use of teaching materials
   (i) Vocabulary building devices
   (ii) Experience charts
   (iii) Phonic element devices
   (iv) Word identification games
   (v) Word building games
   (vi) Context clue devices
f. Selection and organization of activities
   (i) Matching goals with most appropriate activities
   (ii) Explaining purpose of activity to children
   (iii) Giving directions for organization and execution of activity
g. Lesson planning
   (i) Individual and total group
   (ii) Multi-group and individualized
h. Unit planning
   (i) Reading units
   (ii) Integrated with other subjects
i. Curriculum planning
   (i) Identifying reading curriculum problems
   (ii) Clarifying curriculum objectives
   (iii) Planning of curriculum development schedule
   (iv) Interpreting curriculum to public
   (v) Evaluating curriculum

3. *Reading study skills*

a. Classification of pupil-subject related behaviour
   (i) Description of reading study skill behaviours
   (ii) Relation of reading study skill development to environmental and developmental factors
b. Behavioural statement of objectives
   (i) Translation of multiple discrimination, concept and principle goals into observable reading study skill behaviours
c. Construction and use of teacher-made pre- and post-teaching diagnostic devices
   (i) Alphabetization tests
   (ii) Relevant source identification tests

(iii) Hierarchy of relevant information tests
(iv) Skimming comprehension tests
(v) Usage of specific relevant source tests
(vi) Note-taking tests

d. Selection, use and interpretation of standardized achievement tests if available
e. Selection, construction and use of teaching materials
(i) Sequential component tasks for skill complexes
(ii) Identification and correction of incorrect information tasks
(iii) Problems in information collection
(iv) Problems in information organization
(v) Problems in information presentation
f. Selection and organization of activities
(i) Matching goals with most appropriate activities
(ii) Explaining to pupils the purpose of activity
(iii) Giving directions for the organization and execution of activity
g. Lesson planning
(i) Individual and total group
(ii) Multi-group and individualized
h. Unit planning
(i) Single subject
(ii) Integrated with other subjects
i. Curriculum planning
(i) Identifying curriculum problems in reading study skills
(ii) Clarifying objectives of the reading study curriculum
(iii) Planning of curriculum development schedule
(iv) Interpreting curriculum to public
(v) Evaluation of curriculum

4. *Children's literature*

a. Classification of pupil-subject related behaviour
(i) Description of pupil's literary habits and preferences
(ii) Relation of reading habits and preferences to environment and developmental factors
b. Behavioural statement of objectives
(i) Translation of concept, principle and problem solving goals into observable literary reading behaviours
c. Construction and use of teacher-made pre- and post-teaching diagnostic devices
(i) Reading preference inventories
(ii) Reading rate inventories
(iii) Reading comprehension and retention inventories
d. Selection, use and interpretation of standardized achievement tests if available
e. Selection, construction and use of teaching materials
(i) Fiction
(ii) Non-fiction
(iii) Poetry
(iv) Resource persons and field trips
(v) Library usage training materials
(vi) Interest-arousing devices

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(vii) Reading recording devices
f. Selection and organization of activities
(i) Matching goals with most appropriate activities
(ii) Explaining to pupils the purpose of activity
(iii) Giving directions for organization and execution of activity
g. Lesson planning
(i) Individual and total group
(ii) Multi-group and individualized
h. Unit planning
(i) Literature units
(ii) Integrated with other subjects
i. Curriculum planning
(i) Identifying curricular problems in children's literature
(ii) Clarifying objectives for children's literature
(iii) Planning of curriculum development schedule
(iv) Interpreting curriculum to public
(v) Evaluating curriculum

Subject Area II: social studies (in three sections)

1. *Locating, organizing and using information*

a. Classification of pupil-subject related behaviour
(i) Description of data handling behaviour
(ii) Relation of behaviour to environmental and developmental factors
b. Behavioural statement of objectives
(i) Translation of multiple discrimination, concept, principle and problem-solving goals into terms of information handling behaviour
c. Construction and use of teacher-made pre- and post-teaching diagnostic devices
(i) Identification of appropriate source tasks
(ii) Map, globe, chart and graph reading tasks
(iii) Library usage tasks
(iv) Current press usage tests
(v) Selection of relevant data tasks
(vi) Note-taking tests—written sources
(vii) Note-taking tests—oral presentations
(viii) Information synthesis tasks
(ix) Presentation of information—written
(x) Presentation of information—oral
(xi) Presentation of information—graphic
d. Selection, use and interpretation of standardized achievement tests if available
e. Selection, construction and use of teaching materials
(i) Maps, globes, charts and graphs
(ii) Newspapers and magazines
(iii) Historical sources
(iv) Social science sources
(v) Resource persons and field trips
(vi) Films, filmstrips and recordings

(vii) Mapping equipment
(viii) Manuals on identification of flora, fauna, geological formations, etc.
(ix) Detailed community information surveys
(x) Accurate fiction sources related to social studies topics

f. Selection and organization of activities
(i) Matching goals with most appropriate activities
(ii) Explaining the purpose of activity to pupils
(iii) Giving directions to pupils for the organization and execution of activities

g. Lesson planning
(i) Individual and total group
(ii) Multi-group and individualized

h. Unit planning
(i) Social studies units
(ii) Integrated with other subjects

i. Curriculum planning
(i) Identifying information handling curriculum problems
(ii) Clarifying curriculum objectives in information handling
(iii) Planning curriculum development schedule
(iv) Interpreting curriculum to public
(v) Evaluating curriculum

2. *Value examination*

a. Classification of pupil-subject related behaviour
(i) Description of pupil's social values as perceived by observer and by pupil
(ii) Relation of value expressions to environmental and developmental factors

b. Behavioural statement of objectives
(i) Translation of concept and principle goals into terms of valuing behaviour

c. Construction and use of teacher-made pre- and post-teaching diagnostic devices
(i) Value classification checklists
(ii) Value identification tasks
(iii) Value expression tasks

d. Selection, construction and use of teaching materials
(i) Radio and television programmes, if available
(ii) Current press sources
(iii) Textbooks
(iv) Value stories
(v) Role-playing situations

e. Selection and organization of activities
(i) Matching goals with the most appropriate activities
(ii) Explaining purposes of activity to pupils
(iii) Giving directions for organization and execution of activity

f. Lesson planning
(i) Individual and total group
(ii) Multi-group and individualized

g. Unit planning
(i) Identifying curricular problems in value clarification
(ii) Clarifying curricular objectives in value clarification

(iii) Planning curriculum development schedule
(iv) Interpreting curriculum to public
(v) Evaluating curriculum

3. *Problem solving*

a. Classification of pupil-subject related behaviour
   (i) Description of problem-solving processes used by pupils
   (ii) Relation of problem-solving behaviour to environmental and development factors
b. Behavioural statement of objectives
   (i) Translation of concept, principle and problem-solving goals into terms of problem-solving behaviour
c. Construction and use of teacher-made pre- and post-teaching diagnostic devices
   (i) Problem identification tasks
   (ii) Selection of relevant data tasks
   (iii) Identification of possible alternative tasks
   (iv) Problem-solving tasks
d. Selection, construction and use of teaching materials
   (i) Newspaper and magazine sources
   (ii) Non-fiction literature sources
   (iii) Film, radio and television sources if available
   (iv) Commercially produced problem reaction materials (films, filmstrips, recordings, pictures, booklets, etc.)
e. Selection and organization of activities
   (i) Matching goals with the most appropriate activities
   (ii) Explaining to pupils the purpose of activity
   (iii) Giving directions for organization and execution of activity
f. Lesson planning
   (i) Individual and total group
   (ii) Multi-group and individualized
g. Unit planning
   (i) Problem-solving units
   (ii) Integrated with other subjects
h. Curriculum planning
   (i) Identifying curricular problems in problem solving
   (ii) Clarifying curricular goals for problem solving
   (iii) Planning curriculum development schedule
   (iv) Interpreting curriculum to public
   (v) Evaluating curriculum

Subject Area III: science

a. Classification of pupil-subject related behaviour
   (i) Observing
   (ii) Using space-time relationships
   (iii) Using numbers
   (iv) Measuring

(v) Classifying
(vi) Communicating
(vii) Predicting
(viii) Inferring
(Relation of all the above to environmental and developmental factors)

b. Behavioural statement of objectives
(i) Translation of multiple discrimination, concept, principle and problem-solving goals into terms of pupil's scientific behaviour

c. Construction of teacher-made pre- and post-teaching diagnostic devices
(i) Tasks requiring differentiation among textures, volumes, tastes, sizes, shapes, colours, consistencies, weights, temperatures, etc.
(ii) Tasks requiring identification of position, space, direction, clock time, etc.
(iii) Tasks requiring differentiation between speeds of objects, speed of an object and distance it moves, moving and stationary objects, speed with which an object changes position and time required for its arrival at a given point, etc.
(iv) Tasks requiring demonstrations, such as systems moving at angular directions, whether an object has changed position, an object may be folded in more than one way to produce halves, etc.
(v) Tasks requiring identification and comparison of sets, use of symbolic notation, writing of number sentences, etc.
(vi) Tasks requiring ordering of objects by measured length, finding dimensions of objects in centimetres, decimetres or metres, finding area, finding volume, temperature, weight, etc.
(vii) Tasks requiring demonstration of procedure for finding the volume of a liquid using a drop as the unit of volume or using standard metric units such as centilitre, etc.
(viii) Tasks requiring use of two single-stage systems for classifying objects differing in several characteristics or qualities, the construction of a classification system based on operational definition, etc.
(ix) Tasks requiring the construction of a bar graph from a frequency distribution and a frequency distribution from a bar graph, identifying and naming the axis of a bar graph, making force diagrams to show situations in which a force is acting on a body, making a line segment and angle drawing to describe the changes in length and direction of an object's shadow, etc.
(x) Tasks requiring construction of tests of predictions, a revision of a prediction on the basis of additional data, constructing the relationship between two variables that can be used to make a prediction, etc.
(xi) Tasks requiring differentiation between inferences that account for all stated observations and those that do not, ordering inferences with respect to reliability, drawing the transverse, slant, and longitudinal sections of common three-dimensional objects, etc.

d. Selection, use and interpretation of standardized achievement tests if available

e. Selection, construction and use of teaching materials
(i) Measuring devices
(ii) Heat and cold sources
(iii) Geometric shapes
(iv) Three-dimensional shapes corresponding to patterns
(v) Examples of simple and complex machines
(vi) Commercially-produced sets of science teaching materials

f. Selection and organization of activities
   (i) Matching goals with the most appropriate activities
   (ii) Explaining purpose of activity to pupils
   (iii) Giving directions for organization and execution of activity
g. Lesson planning
   (i) Individual and total group
   (ii) Multi-group and individualized
h. Unit planning
   (i) Science units
   (ii) Integrated with other subjects
i. Curriculum planning
   (i) Identifying science curriculum problems
   (ii) Clarifying science curriculum objectives
   (iii) Planning of curriculum development schedule
   (iv) Interpreting science curriculum to public
   (v) Evaluating science curriculum

Subject Area IV: mathematics

a. Classification of pupil-subject related behaviour
   (i) Selection of information relevant to solution of a problem
   (ii) Application of inter-related concepts in thinking, e.g., prime factoring, reducing to lowest terms, intersection of sets
   (iii) Making inferences about numbers
   (iv) Using intuition, application of arithmetic principles
   (v) Application of the concepts of base and place
   (vi) Using sets
   (vii) Using laboratory methods in creative problem solving
b. Behavioural statement of objectives
   (i) Translate multiple discrimination, concept, principle and problem-solving goals into terms of pupil's mathematical thinking behaviour
c. Construction and use of teacher-made pre- and post-teaching diagnostic devices
   (i) Sequential tasks to discover exact weaknesses in concepts relating directly to computation, e.g., a series of subtraction examples requiring regrouping in the tens, hundreds, and thousands places
   (ii) Tasks requiring application of the properties of the four basic operations, e.g., commutative property in addition and multiplication
   (iii) Tasks requiring the application of the concept of set
   (iv) Tasks requiring application of the concept of place value
   (v) Tasks requiring the application of concepts relating to the relationships of positive numbers to zero and to negative numbers
   (vi) Tasks requiring application of an understanding of the relationship between integers and fractions
   (vii) Tasks requiring application of ability to count
   (viii) Tasks requiring ability to make inferences
   (ix) Tasks requiring application of reading to mathematical problem solving
d. Selection, use and interpretation of standardized mathematics achievement tests if available

e. Selection, construction and use of teaching materials
   (i) Abacus, counting frame, pocket chart, and other counting-place devices
   (ii) Flannel or magnet board
   (iii) Number games and puzzles
   (iv) Fraction kits
   (v) Squares and strips kits
   (vi) Motion pictures and filmstrips
   (vii) Text and other symbolic materials
   (viii) Geometric shapes kits
f. Selection and organization of activities
   (i) Matching goals with the most applicable activities
   (ii) Explaining purpose of activity to pupils
   (iii) Giving directions for organization and execution of activity
g. Lesson planning
   (i) Individual and total group
   (ii) Multi-group and individualized
h. Unit planning
   (i) Units on mathematical topics
   (ii) Units integrated with other subjects
i. Curriculum planning
   (i) Identifying mathematics curriculum problems
   (ii) Clarifying mathematics curriculum objectives
   (iii) Planning of curriculum development schedule
   (iv) Interpreting mathematics curriculum to public
   (v) Evaluating mathematics curriculum

Appendix

Glossary of terms

adaptive competency: an ability to modify or adjust in an appropriate manner.

affective: an adjective used to describe the area of human learning which involves feelings, personal values, and other emotional states.

antithetical: the direct opposite. Marked by antithesis or opposition, by contrasting parallel arrangements of ideas, words, etc.

behavioural objective: a specific, observable, measurable aim which serves as a guide for a teaching unit and which is directed toward the eventual achievement of a general objective.

cognitive: an adjective used to describe the mental functioning whereby an organism becomes aware or obtains knowledge of an object, act or concept.

congruence: the quality or state of being in agreement.

cost/benefit: the value one receives per unit of cost. For example, the percentage of tasks accomplished per fixed unit of monetary exchange. (See also cost/effectiveness).

cost/effectiveness: an abstraction used to denote the benefit received for monies expended. Synonymous with cost/benefit.

criterion performance: performance based on tasks defined as *critical* for necessary competency.

cycling: an interval of time during which a succession of events is completed.

elicited: drawn forth or brought out.

empirical development: development based on observation or experience.

entry behaviour: the sum or total of skills and behaviours with which the learner enters a performance environment; usually restricted to behaviours which will directly interact with subsequent performance.

explicit performance: externally visible performance, usually fully developed or formulated. Also used to indicate a specific, definite performance. (See also overt behaviour.)

incremental steps: a series of small units in an activity which lead toward a positive increase or gain in knowledge or competency. Each unit represents a specific, observable, behavioural act.

individualization of instruction: differentiation of instruction according to individual differences in pupils; the differences may be in personality, abilities, motivation, needs, wants, etc.

instructional act: the act of guiding the pupil within the areas of objectives, subject-matter, strategies, media and evaluations. As used in the model the term refers to the behaviour

of an instructional manager in effecting pupil outcomes and considers at least the above-mentioned components.

instructional competencies: skills needed to perform the instructional act. As used in the model, instructional competencies are the observable, overt behaviours needed by the instructional manager (teacher) to elicit desired pupil outcomes (behaviours).

instructional setting: the total environment in which the instructional act is conducted. The model represents the instructional setting as being peculiar for each set of pupils, for each given pupil, and for different given pupil outcomes.

instructional staff: in a teacher-training programme, the teaching staff directly responsible for classroom instruction involving trainees. This staff is distinct from the management and support staffs.

instructional strategy: as used in the model, this term denotes the specific way of presenting instructional material or conducting instructional activities. It is part of the instructional act and is synonymous with the method.

instructional tasks: those parts of the total behaviour of the effective instructional manager which can be reduced to manageable units of behaviour. In the model they are blocks of behaviour that, when performed, indicate gain either in knowledge or competency.

interdependent: dependant upon one another; mutually dependant.

inter-disciplinary: involving professional groups from various subject-matter fields.

inter-personal competency: competency in relations between different persons.

inter-system: relationships between systems or sub-systems when such inter-action occurs.

intra-personal: characteristic of a person's inner mental and emotional being. The area concerned with self-understanding, for example.

intra-system: relationships within the system itself; for example, between components.

intrinsic: belonging to the essential nature of a thing.

learner characteristics: as used in the model, any of the characteristics of the learner which are variable and may influence performance.

linear-type system: a single-track system without alternative routes; for example, a programme with steps in sequence.

mediate: to act as an intermediary agent in effecting or communicating.

micro-teaching: a short, concentrated teaching effort directed at very specific objectives—used to simulate the conditions of a real classroom or instructional setting.

non-instructional competencies: those skills which enhance the teacher's success in performing the instructional act but which are not actually part of the act; for example, record-keeping, ability to confer with parents, etc.

objective: an aim or goal. In education there are various levels of objectives; for example, general, specific and behavioural. Or they may be discriminated by type: cognitive, affective, psychomotor.

obtrusive measures: noticeable measures. An evaluation instrument which is apparent to the persons whose abilities are being measured. For example, a written examination.

overt behaviour: an act that can easily be observed; that is, behaviour which is expressed in some physical form (such as speaking or writing).

parameter: one of the number of components which serves to define the whole. A variable in terms of which other variables are expressed, rather than in terms of one another.

para-professional: a teacher's aide; a person, usually with less training and fewer competencies, who assists the teacher in performing his duties.

practicum: an academic exercise which combines study and practical work. A course of instruction aimed at relating the study of theory with practical experience.

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prototype: a model upon which the system is patterned; that is, usually the original plan which may subsequently be modified by cycling or some other adaptive-corrective mechanism.

psychomotor: an adjective used to describe the areas of human learning which involve the physical or motor processes. Includes all sensory and motor activities. A simple example of a psychomotor skill is the ability to write with a pencil.

re-cycling: repeating a cycle or succession of events in order to improve the level of performance or to take into consideration new information.

remediation: corrective instruction, intended in part or whole to overcome any particular deficiency of a pupil. An example might be the re-cycling of a learning activity.

requisite behaviour: essential or necessary behaviour.

simulated condition: a method whereby the environment of the teaching-learning situation is set up and controlled for the purpose of training.

synthesis: the combination or production of parts or elements so as to form a whole.

system: the set of orderly and persisting inter-relations between parts of a whole.

systems analysis: the discovery, identification, and ordering of components and sources of variability in a system; includes measurement of error and arrangement of elements to improve system performance.

systems technology: the applied science of systems analysis and synthesis.

taxonomy: the classification of data according to their natural or perceived relationships.

teaching act: see intructional act.

teaching competency : see instructional competency.

terminal behaviours: behaviours which are the desired end-product of a unit of instruction. These are usually expressed in the behavioural objectives.

terminal criterion measure: an evaluation which indicates successful accomplishment of the criterion steps or critical points within a unit of learning.

three Rs: reading, 'riting, and 'rithmetic (reading, writing, arithmetic). Historically, considered the 'basics' of an education.

traits: the attributes of an individual. These are usually observable characteristics and relatively permanent modes of behaviour.

transactions: processes or instances of transacting or negotiating; mutual inter-action.

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[B. 2997]